SELECTED WATER RESOURCES ABSTRACTS

VOLUME 4, NUMBER 20
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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

HOW TO MEASURE THE ISOTHERMAL COMPRESSIBILITY OF LIQUIDS ACCURATELY,
National Engineering Lab., East Kilbridge (Scotland).
A. T. J. Hayward.
Journal of Physics D: Applied Physics, Vol 4, No 7, p 938-950, July 1971. 13 p, 6 fig, 59 ref.

Descriptors: *Compressibility, *Hydrostatic pressure, *Instrumentation, *Calibrations, Water properties, Measurement, Piezometry, Physical properties.
Identifiers: Compressibility (Liquids).

The isothermal compressibility of liquids may be measured directly with an accuracy of at least plus or minus 0.4%. Distortion is minimized by making the apparatus of material heat-treated to reduce anisotropy and by surrounding it with a balancing pressure. Ground glass or lapped metal joints should be used. The apparatus interior must be free of air traps. The equipment must be calibrated for measuring volume change to the highest possible standard of precision, at least to within plus or minus 0.1% of the smallest volume change to be measured. (Knapp-USGS)
W71-10689

1B. Aqueous Solutions and Suspensions

INVESTIGATION OF ION MOBILITY IN AQUEOUS SOLUTIONS,
Tyco Laboratories, Inc., Waltham, Mass.
For primary bibliographic entry see Field 03A.
W71-10656

ELECTROMETRIC METHOD FOR ANALYZING WATER EXTRACTS AND GROUNDWATER (Elektrometricheskiy metod analiza vodnykh vytyazhek i gruntovykh vod),
Tadzhik Scientific Research Inst. of Soil Science, Dushambe.
For primary bibliographic entry see Field 07B.
W71-10830

02. WATER CYCLE

2A. General

ON THE ROLD OF THE ATMOSPHERE IN HYDROLOGY (Portugese: O papel da atmosfera na hidrologia),
Lisbon Univ. (Portugal). Faculty of Sciences.
For primary bibliographic entry see Field 02B.
W71-10581

OGALLALA AQUIFER SYMPOSIUM,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 02F.
W71-10677

WHY HYDROLOGY,
Hydrological Research Unit, Wallinford (England).
John C. Rodda.
Nature, Vol 232, No 5309, p 301-303, July 30, 1971. 3 p, 1 fig, 10 ref.

Descriptors: *International Hydrological Decade, *Hydrology, *Reviews, Hydrologic cycle, Water balance, Documentation.

A progress review of the first six years of the International Hydrological Decade is presented. Perhaps the computer revolution and particularly the mathematical models of catchment behavior that have results is one of the most noteworthy features. Advances in methods of analysis have certainly been rapid recently, so much so that faults in the basic measurements are becoming one of the chief hindrances to further progress. Britain seems to be well placed, for there are few countries with equal experience in instrumentation, particularly in rainfall measurement, stream gaging and soil moisture assessment. The problems resulting from Britain's relatively recent start in scientific hydrology are rapidly being overcome. Hydrology is now an established science, a science that is extremely valuable to the community at large. (Woodard-USGS)
W71-10808

GENERALIZED ANALYSIS OF SMALL WATERSHED RESPONSES,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 04D.
W71-10877

2B. Precipitation

A MODELING STUDY OF SEVERAL ASPECTS OF CANOPY FLOW,
Utah Univ., Salt Lake City.
For primary bibliographic entry see Field 02I.
W71-10459

INDEPENDENCE OF MONTHLY AND BIMONTHLY RAINFALL OVER SOUTHEAST ASIA DURING THE SUMMER MONSOON SEASON,
Institute of Tropical Meteorology, Poona (India).
D. A. Mooley.
Monthly Weather Review, Vol 99, No 5, p 532-536, June 1971. 5 p, 1 fig, 11 tab, 5 ref.

Descriptors: *Rainfall, *Monsoons, *Statistics, *Correlation analysis, Seasonal, Wet seasons, Rain gages, Meteorological data, Synoptic analysis.
Identifiers: *Southeast Asia.

Independence of monthly and bimonthly rainfall was investigated for 39 well-distributed and long-record stations in the field of the Asian summer monsoon. Monthly rainfall is pair independent but is not triplet or quadruplet independent. Rainfall during the first half of the summer monsoon season is independent of rainfall during the second half. The implications of these results are discussed. There is no justification for the belief that excess or deficit of rainfall in the first half will be respectively wiped off or made up during the second half of the summer monsoon season. (Knapp-USGS)
W71-10460

A SEARCH FOR NECESSARY CONDITIONS FOR HEAVY SNOW ON THE EAST COAST,
New York Univ., New York. Dept. of Meteorology and Oceanography.
Edward A. Brandes, and Jerome Spar.
Journal of Applied Meteorology, Vol 10, No 3, p 397-409, June 1971. 13 p, 13 fig, 3 tab, 11 ref.

Descriptors: *Meteorology, *Synoptic analysis, *Snowfall, *Weather forecasting, Storm structure, Weather patterns.
Identifiers: *Snow forecasting.

An investigation into the synoptic conditions necessary for the occurrence of heavy snow on the east coastal plain of the United States has revealed no obvious characteristic antecedent patterns either 12 or 24 hr prior to the onset of snow. The contemporaneous association of heavy snow with east coastal secondary cyclo-genesis and with certain synoptic features at the 850-mb level is found to be of limited predictive value. (Knapp-USGS)
W71-10461

CLOUD CONDENSATION NUCLEI AND THEIR POSSIBLE INFLUENCE ON PRECIPITATION,
Hebrew Univ., Jerusalem (Israel). Dept. of Meteorology.
B. Terliuc, and A. Gagin.
Journal of Applied Meteorology, Vol 10, No 3, p 474-481, June 1971. 8 p, 10 fig, 1 tab, 14 ref.

Descriptors: *Nucleation, *Precipitation (Atmospheric), *Condensation, *Meteorology, Raindrops, Cloud physics, Chemistry of precipiation, Sampling, Winds.
Identifiers: *Israel.

Measurements were made in Israel of cloud condensation nuclei (CCN) both from the ground and from an instrumented aircraft during two winter seasons. Spectra of CCN always have, in both rainy and dry weather, continental-like characteristics. Their concentrations depend on wind direction and are high, even in air masses with a partial maritime trajectory. The existence of local sources appears to have a limited and a generally minor effect on the characteristics of CCN spectra. On the average, CCN concentrations tend to decrease by a factor of 2 during the first three days of a rainy spell. Consequently, cloud droplet concentrations computed for cumulus clouds assumed to have base updraft velocities of 250 cm per sec, show a similar trend but are always within the range of 180-950 per cc. Since these variations do not correlate with rainfall, they are not dominant in their effect on the relative efficiency of the rain-forming processes. However, the high concentrations of CCN, and thus, of cloud droplets, must have a significant effect on the nature of these processes in view of the resulting high colloidal stability of local clouds, (Knapp-USGS)
W71-10463

CALENDAR SINGULARITIES IN RHODESIAN PRECIPITATION, AND THE IMPLICATIONS.
Meteorological Service, Salisbury (Rhodesia).
D. L. McNaughton.
Journal of Applied Meterorology, Vol 10, No 3, p 498-501, June 1971. 4 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Precipitation (Atmospheric), *Nucleation, *Distribution patterns, *Meteorology, Weather forecasting, Synoptic analysis, Dusts, Meteorites.
Identifiers: *Rhodesia.

It is suggested that Bowen's meteor hypothesis has special relevance in the Southern Hemisphere, because of its comparatively small area of land and the fairly slow interhemispheric exchange of air. This hypothesis is discussed in the light of tritium measurements in Rhodesian rain. The existence of calendar singularities is established in Rhodesian rainfall records, the pattern repeating itself in the hail records of years which do not overlap those used for the rainfalls. Salisbury and Bulawayo derive almost coincident peaks with rain falling in completely different years, indicating that a secondary rather than primary weather mechanism is responsible for some of the singularities. Others are associated with pressure fluctuations over South Africa. (Knapp-USGS)
W71-10464

THE DESIGN AND EVALUATION OF RAINFALL MODIFICATION EXPERIMENTS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 03B.
W71-10465

PRECIPITATION RESULTS OF TWO RANDOMIZED PYROTECHNIC CUMULUS SEEDING EXPERIMENTS,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Meteorological Statistics Lab; and National Oceanographic and Atmospheric Administration, Coral Gables, Fla. Experimental Meteorology Lab.
For primary bibliographic entry see Field 03B.
W71-10466

SEASONALITY OF PRECIPITATION IN THE UNITED STATES,
Fresno State Coll., Calif. Dept. of Geography.
Charles G. Markham.
Annals, Association of American Geographers, Vol 60, No 3, p 593-597, September, 1970. 5 fig, 1 tab, 2 ref.

Descriptors: *United States, *Precipitation (Atmospheric), *Seasonal, *Climatic data, Wet seasons.
Identifiers: *Seasonality index, *Vectors (Physical), *Seasonal rainfall concentration.

Seasonality of precipitation is the tendency of a place to have more rainfall in certain months or seasons than in others. Bar graphs are usually used to show mean monthly rainfall and illustrate seasonality at a single location, but do not permit easy quantitative generalizations when comparing different locations. The basic assumption is made that mean monthly rainfall figures are vector quantities, with magnitude being the amount of rain and direction being the month of the year expressed in units of arc. If the 12 monthly vectors are then summed for a given location, the resultant direction representing the period of seasonal concentration. Using data from 625 weather stations in the U.S. and adjacent regions, maps of Seasonality Index and Seasonal concentration are presented. Precipitation in the U.S. has 4 principal regimes: August Arctic Regime, January West Coast Regime, August Tripical Regime and June Mid-Continent Regime. Additionally, there is a small, non-seasonal regime (Seasonality Index 10% or less) in the dry Great Basin Desert. (Casey-Arizona)
W71-10481

THE DUST BOWL IN THE 1970s,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 03F.
W71-10482

CONTROLLING THE PLANET'S CLIMATE,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 03B.
W71-10483

THE PHYSIOGRAPHIC REGIONALIZATION OF NORTHERN ETHIOPIA (IN GERMAN),
For primary bibliographic entry see Field 06B.
W71-10499

SPATIAL CHARACTERISTICS OF THUNDERSTORM DEVELOPMENT IN THE CENTRAL SUDAN,
Southern Oregon Coll., Ashland. Dept of Geography.
Richard M. Hammer.
Supported by U. S. Army Research Office - Durham. Proceedings, Association of American Geographers, Vol 1, p 67-70, 1970. 4 fig 4 ref.

Descriptors: *Thunderstorms, *Cloud cover, *Semiarid climates, *Rainfall, Orography, Topography, Mapping, Diurnal, Hydrograph analysis.
Identifiers: *Sudan, *Cloud development, *Cumulonimbus.

Cumulonimbus development in the Central Sudan was analyzed by utilizing E.S.S.A. 9 imagery for July and August 1969. The daily imagery was projected on a grid map of the region and cell locations were noted on a base map. Cloud densities and cloud organization were tabulated and mapped. Cloud location was correlated daily with rainfall location and relief. Only 2 regions of significant relief exist in the study area and these regions are the only significant loci of cloud density. The inter-Nile plain was the region of highest density, and both orographic and Nile marshland factors seemed to influence this density, while in the Jebal Marra region only orographic factors were responsible. Of the 4 types of cloud organization, linear clouds occurred 65-70% of the time and their monthly linear organization totals confirmed the importance of the Jebal Marra and inter-Nile plain as major formative areas. The general location of thunderstorm lines also explain the diurnal incidence of regional rainfall. (Casey-Arizona)
W71-10506

PROJECT SKYWATER, 1970 ANNUAL REPORT.
Bureau of Reclamation, Denver, Colo. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 03B.
W71-10575

ON THE ROLD OF THE ATMOSPHERE IN HYDROLOGY (Portugese: O papel da atmosfera na hidrologia),
Lisbon Univ. (Portugal). Faculty of Sciences.
Jose Pinto Peixoto.
Fomento (Lisbon), Vol 8, No 3, p 289-297, 1970. 9 p, 5 fig, 1 tab, 3 ref. (Also published in Ministerio do Ultramar Decenio Hidrologico Internacional, No 10, 1970).

Descriptors: *Hydrology, *Atmosphere, *Meteorology, *Climatology, *Hydrologic cycle, Climatic zones, Climatic data, Water vapor, Air circulation, Earth (Planet), Water balance.
Identifiers: Physiography.

The dynamical aspects of the atmospheric branch of the hydrological cycle is studied, in particular a discussion of the mean atmospheric water vapor fields on a planetary scale during the International Geophysical Year covering the calendar year 1958. The fields of mean precipitable water content and the vectorial transport of water vapor were analyzed on a planetary scale for both hemispheres and related with the physiography of the surface of the Earth. Averaged values of the precipitable water and of the mean specific humidity with height and the total meridional flux according to climatic zones are presented in graphical or tabular forms and compared with results from climatological data. The nature of these fields is discussed in association with the main features of the general circulation of the atmosphere. Implications of the study for the zonal hydrological balance on a planetary scale are analyzed. (Woodard-USGS)
W71-10581

CAUSES OF RECENT INCREASED EROSION ALONG UNITED STATES SHORELINES,
Wilkes Coll., Wilkes-Barre, Pa.
For primary bibliographic entry see Field 02J.
W71-10711

PRECIPITATION AND ITS MEASUREMENT, A STATE OF THE ART,
Wyoming Univ., Laramie. Water Resources Research Inst.
Lee W. Larson.
Available from the National Technical Information Service as PB-201 747, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No. 24, June, 1971, 74p, 35D ref. OWRR Project A-001-WYO (45).

Descriptors: *Precipitation (Atmospheric), Climatic data, Equipment, Statistics, Wind, Rainfall, Rain gages, Rain, Snow, Snowfall, Snow gages, Snow surveys, *Measurement, Bibliographies, *Reviews, Gages.

A comprehensive review of the literature since 1966 for studies and articles dealing with precipitation and its measurement. Topics discussed include gages, gage comparisons, gage shields, errors in measurements, precipitation data, data analysis, networks, and electronic measurements for rain and snow. A partially annotated bibliography of 350 references is included.
W71-10752

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA WATER YEAR 1970.
Wyoming Univ, Laramie. Water Resources Research Inst.

Available from the National Technical Information Service as PB-201 748, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No. 23, May 1971, 277p. OWRR Project A-001-WYO (44).

Descriptors: Data processing, *Data collections, *Temperature, *Humidity, *Climatic data, Precipitation (Atmospheric), Wyoming.
Identifiers: *Relative humidity.

Temperature and relative humidity data that have been reduced from hygrothermograph charts and precipitation data from recording and non-recording precipitation gages are presented in tabular form. Four readings per day at 0600, 1200, 1800 and 2400 hours and the maximum and minimum are presented. The mean, maximum, and minimum temperatures are also shown graphically. The reduced data are transferred to punch cards for computation and tabulating by the University of Wyoming's digital computer. The card format and computer program are presented in WyoWRRI Water Resources Series No. 8.
W71-10753

LAKE ONTARIO SEEDING TRIALS - 1971.
National Oceanic and Atmospheric Administration, Miami, Fla. Research Flight Facility.
For primary bibliographic entry see Field 03B.
W71-10768

FLORIDA CUMULUS SEEDING EXPERIMENT 1970: SILVER CONTENT OF PRECIPITATION,
Miami University, Fla. Rosenstiel School of Marine and Atmospheric Sciences.
For primary bibliographic entry see Field 03B.
W71-10779

EVAPORATION OF CONTAMINATED AND PURE WATER DROPLETS IN A WIND TUNNEL,
Nevada Univ; Reno. Desert Research Inst.
Thomas E. Hoffer, and Steven C. Mallen.
Available from the National Technical Information Service as AD-716 732, $3.00 in paper copy, $0.95 in microfiche. Journal of Atmospheric Sciences, Vol 27, No 6, p 914-918, Sept 1970.

Descriptors: *Fog, *Raindrops, *Evaporation control, *Clouds, *Monomolecular films, Contamination, Air pollution.
Identifiers: *Fog dispersal.

Measurements of evaporation rates suggest that when water droplets are exposed to certain contaminants, a monolayer can form which inhibits evaporation. Experimental droplet evaporation rates are compared to theoretical rates; for pure water the agreement is good, while for contaminated water a wide variance is noted. Some of the implications of these experiments in relation to the dispersion of fogs are discussed.
W71-10785

METEOROLOGY, CLIMATOLOGY AND HYDROLOGY (Meteorologiya, klimatologiya i gidrologiya).

Meteorologiya, Klimatologiya i Gidrologiya, No 6, Kiev University, 1970. 229 p.

Descriptors: *Precipitation (Atmospheric), *Moisture content, *Climatic data, *Meteorological data, *Runoff, Atmospheric physics, Cloud physics, Winds, Air circulation, Crop production, Soil erosion, Hydrographs,

Correlation analysis, Soils, Plant growth, Groundwater, Solar radiation, Mathematical studies, Forecasting, Watersheds (Basins).
Identifiers: *USSR, *Ukraine, *Kazakhstan, *Moldavia, *Aerology, Carpathian Mountains, Caucasus, Odessa, Traveltime, Moisture transport.

This collection of 41 articles is devoted largely to aerological investigations in the Ukraine, including studies of local winds, convective clouds, and moisture transport. Considerable attention is paid to plant growth, crop production and agrometeorological methods of study both in the Ukraine and in other republics of the USSR. Studies in the field of hydrology deal primarily with the formation of runoff. The majority of articles in the collection are the work of graduate students, lecturers, senior and junior instructors affiliated with the Odessa Hydrometeorological Institute. (See also W71-10835 thru W71-10837) (Josefson-USGS)
W71-10834

THE MOISTURE REGIME OF INDOCHINA (O nekotorykh osobennostyakh rezhima uvlazhneniya Indokitaya),
Gidrometeorologicheskii Institut, Odessa (USSR).
Nguen Min'Fu, and L. K. Smekalova.
Meteorologiya, Klimatologiya i Gidrologiya, No 6, p 55-59, 1970. 3 tab, 2 ref.

Descriptors: *Moisture content, *Water utilization, *Precipitation (Atmospheric), *Hydrologic cycle, Monsoons, Seasonal, Air masses, Temperate, Meteorological data, Thermocline, Orography, Winds.
Identifiers: *Indochina, Hanoi, Saigon.

The moisture regime of Indochina is closely associated with the characteristics of monsoon circulation. The winter monsoon current flowing into the northern part of Indochina is directly related to the polar air formed in the Siberian anticyclone. Maximum precipitation totals were observed on the western windward coast of Indochina (1,400 mm at Akyab and 836 mm at Mergui in July). On the east coast maximum values were observed at Hanoi (319 mm) and at Saigon (301 mm); the maximum precipitation at Nhatrang and Tourane for the same month was 44 mm and 80 mm, respectively. Moisture content values for Indochina undergo the same marked space-time variations as precipitation. The moisture content of air masses in winter is almost 1.5-2 times less than that in summer and ranges in January from 2.16 g/sq cm at Hanoi to 3.86 g/sq cm at Tourane. Moisture content values and coefficients of water utilization are used to determine the relationship of precipitation to the moisture content of air masses. (See also W71-10834) (Josefson-USGS)
W71-10835

PRECIPITATION IN NORTHERN KAZAKHSTAN DURING A HARVEST SEASON (Rezhim osadkov perioda uborki urozhava v Severnom Kazakhstane),
Gidrometeorologicheskii Institut, Odessa (USSR).
T. V. Varbanets.
Meteorologiya, Klimatologiya i Gidrologiya, No 6, p 85-90, 1970. 3 tab, 4 ref.

Descriptors: *Precipitation (Atmospheric), *Harvesting, *Antecedent precipitation, *Seasonal, *Weather forecasting, Correlation analysis, Forecasting, Wet seasons.
Identifiers: *USSR, *Kazakhstan, Petropavlovsk, Kustanay, Kokchetav, Tselinograd, Pavlodar, Correlation coefficient.

Prolonged periods of rain during a harvest season may delay a harvest, sharply reduce total grain yield, and even result in the complete loss of a crop; hence, it is important to know the distribution of rainy days in a harvest period. The amount of precipitation received during a harvest period can be predicted from the precipitation of the previous three months. In Northern Kazakhstan May-July precipitation is most often 75-125 mm; in the harvest months of August and September precipitation drops to less than 40 mm. The duration of storm periods in August and September generally does not exceed 4 days. The length of a dry period in August ranges from 15 days at Kokchetav to 31 days at Kustanay. The duration of a dry period in September runs from 14 days near Petropavlovsk to 28 days at Tselinograd. The probability of wet months during a harvest period seldom exceeds 50%; dry months are generally more frequent than wet months. (See also W71-10834) (Josefson-USGS)
W71-10836

CORRELATIONS OF YIELD WITH PRECIPITATION AND OTHER METEOROLOGICAL INDICES (K voprosu o korrelyatsionnykh svyazyakh urozhaya s osadkami i drugimi meteorologicheskimi elementami),
Odessa Hydrometeorological Inst., USSR.
Gidrometeorologicheskii Institut, Odessa (USSR).
T. V. Varbanets.
Meteorologiya, Klimatologiya i Gidrologiya, No 6, p 91-95, 1970. 1 tab, 7 ref.

Descriptors: *Harvesting, *Precipitation (Atmospheric), *Correlation analysis, Meteorological data, Climatic data, Seasonal, Air temperature, Humidity, Crop production, Yield equations, Regression analysis, Plant growth.
Identifiers: *USSR, Kazakhstan, Tillering.

A total of 14 variables was used to study the relationships between yield and climatic factors, including precipitation, for Northern Kazakhstan. The variables used included total precipitation during the warm and cold season, total precipitation and average temperature for the tillering-heading (ear formation) phase of plant growth, and the number of days with precipitation during the warm season and the tillering heading-phase. The number of days with precipitation during the warm season had the greatest influence on yield (correlation coefficient 0.43). The correlation coefficient between yield and total precipitation during this period was 0.24. Days with a relative humidity of less than 30% in the tillering-heading phase had a particularly deleterious effect on yield. Yield conditions in this phase improved with an increase in total precipitation and in the number of days with precipitation. The correlation coefficient between total precipitation in the tillering-heading phase and total precipitation during the warm season was 0.63. A high correlation coefficient (0.72) between the number of days with precipitation and the total precipitation in the tillering-heading phase is typical of all Northern Kazakhstan. (See also W71-10834) (Josefson-USGS)
W71-10837

2C. Snow, Ice, and Frost

A SEARCH FOR NECESSARY CONDITIONS FOR HEAVY SNOW ON THE EAST COAST,
New York Univ., New York. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 02B.
W71-10461

APPLICATION OF ENVIRONMENT ANALYSIS TO WATERSHED SNOWMELT,
Agricultural Research Service, Burlington, Vt., New England Watershed Research Center; and Vermont Univ., Burlington. Dept. of Civil Engineering.
Robert L. Hendrick, Bruce D. Filgate, and Walter M. Adams.
Journal of Applied Meteorology, Vol 10, No 3, p 418-429, June 1971. 12 p, 14 fig, 3 tab, 9 ref.

Descriptors: *Snowmelt, *Topography, *Mathematical models, *Runoff forecasting, *Flood forecasting, Weather, Solar radiation, Wind, Temperature, Vegetation effects, Meteorology, Albedo.
Identifiers: *Sleepers River Experimental Watershed (Vt).

The role of environmental characteristics of elevation, slope-aspect and forest cover in spatially differentiating the snowmelt rate was examined over a 43-sq mi northern Vermont watershed. Both energy balance considerations and selected melt observations indicate the operation of an effective natural snowmelt runoff control mechanism. The more spatially diverse the combination of elevation slope-aspect and forest cover are, the more effective the natural snowmelt control mechanism is likely to be. Snowmelt models developed by the U.S. Corps of Engineers were modified to fit topographic and forest conditions in New England. The modified model was used to compare average snowmelt rates over a typical upland Vermont watershed, a highly diverse watershed in the White Mountains of New Hampshire, and a watershed of maximum homogeneity in the open flat Champlain Valley of Vermont. The profound role of environment in regulating snow-water release is apparent. Rapid snowmelt runoff is extremely unlikely except in environmentally homogeneous watersheds or during unusual weather sequences in which sensible heat and condensation heat energy are added rapidly and uniformly to the entire watershed snow cover. As most of the snowmelt in northern New England results from solar radiation over watersheds of great environmental diversity, the region appears to enjoy a highly effective natural snowmelt runoff control mechanism. (Knapp-USGS)
W71-10462

SEASONAL SNOW COVER--A GUIDE FOR MEASUREMENT COMPILATION AND ASSEMBLAGE OF DATA.

UNESCO--IASH--WMO Contribution to International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 2, 1970. 38 p, 5 fig, 45 ref, 3 append.

Descriptors: *Snow surveys, *Glaciers, *Ice, *Data collections, *International Hydrological Decade, *Permafrost, Water yield, Regimen, Water resources development, Water resources, Runoff, Melt water, Standards, Stations, Snowpacks, Antarctic, Water balance, Heat balance, Snowmelt.
Identifiers: *Glacier surveys, *Snow and ice inventory.

Since about 80 per cent of all fresh water exists in solid form, an accurate assessment of the amount, distribution and variation of all snow masses, both near and far from areas at present inhabited is of importance for the understanding of man's environment. To comply with the need for more complete and detailed information on ice and snow, the Co-ordinating Council of the IHD at its first session passed a resolution recommending to Member States the mapping and inventory of permanent snow and ice masses and the compilation and assemblage of data for publication in order to obtain the elements necessary for the establishment of the regional distribution of permanent and seasonal snow, permafrost and ice. Guidance and inventory methods are given for the compilation of a world inventory of perennial and seasonal ice and snow masses as a contribution to the estimation of the world water balance. (Knapp-USGS)
W71-10576

SAMPLING OF GLACIAL SNOW FOR PESTICIDE ANALYSIS,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 05A.
W71-10675

SOME EFFECTS OF ICE ON A RIVER BED,
Keele Univ. (England). Dept. of Geology.

John D. Collinson.
Journal of Sedimentary Petrology, Vol 41, No 2, p 557-564, June 1971. 8 p, 12 figs, 18 ref.

Descriptors: *Ice, *River beds, *Erosion, *Channel morphology, *Sedimentary structures, Scour, Geomorphology, Sedimentation, Beaches, Ice breakup, Floods.
Identifiers: *Tana River (Norway).

Morphological activity on ice on the bed of the Tana River of Finnmark, Norway, during the Spring flood is concentrated into a short period of time when water stage is changing rapidly. Ice affects the bed in four ways. (1) Actual contact of the ice with the bed gouges grooves if the ice is still moving or flattens the microrelief of the surface if the velocity is low. (2) Grounded blocks in a strong flow generate separation eddies which cause local depositional and erosional irregularity. (3) Blocks of ice melting on a subaerially exposed sediment surface disturb the surface as they collapse. (4) Depressions are thought to be due to the melting of buried ice blocks, probably frozen to the sediment surface. The preservation potential of these structures is low but they might, in exceptional circumstances, be found in fluviatile sandstones. (Knapp-USGS)
W71-10720

DENSITY OF GLACIER ICE,
P. A. Shumskii.
Available from the National Technical Information Service as AD-720 057, $3.00 in paper copy, $0.95 in microfiche. Trans. from Akademiya Nauk SSSR. Doklady, v 126, n 4, 1959, Cold Regions Research and Engineering Laboratory Translation 224, 1971. 12 p.

Descriptors: *Ice, *Glaciers, *Melting, *Pressure, *Volume, Surfaces.
Identifiers: Thickness, Surface properties, Compressive properties, Structural properties, Geologic age determination, USSR, *Glacier nourishment.

Glaciers are moving masses of ice of atmospheric origin, containing a considerable amount of enclosed air. As new layers accumulate in regions of glacier nourishment, glacier ice is buried to very great depths from the surface (sometimes to 3-1 km), while in regions where the glacier is diminishing, the ice melts out towards the surface. As the ice is buried, it is compressed and densified under pressure of overlying layers, but as it returns to the surface, it partially expands again and becomes less dense. The pressure at depth in the glacier depends both on the depth below the surface and on the density of the ice, and the latter changes also under the influence of temperature differences between different parts of the glacier. At a given rate of accumulation or melting of the ice on the surface, the rate of submergence or rise of the ice at depth is related to its densification or expansion. Accordingly, the age of the ice also differs at this or that depth.
W71-10773

COMBINED HEAT, ICE AND WATER BALANCES AT SELECTED GLACIER BASINS--A GUIDE FOR COMPILATION AND ASSEMBLAGE OF DATA FOR GLACIER MASS BALANCE MEASUREMENTS.

UNESCO--IASH Contribution to International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 5, 1970. 20 p, 1 fig, 1 tab, 2 append.

Descriptors: *Snow surveys, *Glaciers, *Ice, *Data collections, *International Hydrological Decade, *Permafrost, Water yield, Regimen, Water resources development, Water resources, Runoff, Melt water, Standards, Stations, Snowpacks, Antarctic, Water balance, Heat balance, Snowmelt.
Identifiers: *Glacier surveys, *Snow and ice inventory.

Since about 80 percent of all fresh water exists in solid form, an accurate assessment of the amount, distribution and variation of all snow masses, both near and far from areas at present inhabited is of importance for the understanding of man's environment. To comply with the need for more complete and detailed information on ice and snow, the Co-ordinating Council of the IHD at its first session passed a resolution recommending to Member States the mapping and inventory of permanent snow and ice masses and the compilation and assemblage of data for publication in order to obtain the elements necessary for the establishment of the regional distribution of permanent and seasonal snow, permafrost and ice. Guidance and inventory methods are given for the compilation of a world inventory of perennial and seasonal ice and snow masses as a contribution to the estimation of the world water balance. (Knapp-USGS)
W71-10823

2D. Evaporation and Transpiration

WIND EFFECT ON THE EVAPORATION RATE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
Ido Seginer.
Journal of Applied Meteorology, Vol 10, No 2, p 215-220, April 1971. 5 fig., 7 ref.

Descriptors: *Evaporation, *Model studies, *Wind velocity, *Resistance, *Water vapor, Diffusion, Theoretical analysis, Humidity, Latent heat, Temperature, Surfaces.
Identifiers: *Atmospheric evaporation resistance, *Evaporation surfaces, *Relative humidity.

Wet surface (zero water vapor diffusion resistance) evaporation increases with increases in wind speed. For non-wet surfaces, evaporation increases with increasing wind speed, below a critical diffusion internal resistance point, and above which it decreases. Wind speed effects on evaporation also are dependent on relative humidity. To explore these effects, a 1- dimensional resistance model with a water vapor source, a surface-atmospheric interface and inner and outer boundaries, was constructed using energy balance equations for the surface and vapor source levels and a vapor continuity equation, potential temperatures and humidities can be derived providing resistances and boundary conditions are known. There is a discontinuity in the evaporation rate of the system in the interval between very low vapor diffusion resistance to zero resistance. Real materials have properties between the extremes of surface opaqueness and surface transparency and may mask such a predicted discontinuity. Nevertheless, over most of the range of internal vapor diffusion and transfer resistances, results based on computational experiments with the model should be valid. (Casey-Arizona)
W71-10479

RELATIONS BETWEEN NET AND SOLAR RADIATION,
Water Conservation Lab., Phoenix, Ariz.
Sherwood B. Idso.
Journal, Meteorological Society of Japan, Vol 49, No 1, p 1-12, February, 1971. 1 fig, 5 tab, 15 ref.

Descriptors: *Solar radiation, *Infrared radiation, *Estimating equations, *Evaporation, *Heat exchange, Albedo, Regression analysis, Correlation analysis, Sudangrass, Alfalfa, Surfaces, Latent heat, Convection, Irrigation, On-site investigations.
Identifiers: *Net radiation.

Net radiation may be expressed as a simple linear function of total net incoming radiation, where the slope is 1-albedo and the intercept is net long-wave radiation. The same equation may be empirically expressed using a and b as regression constants. Recently, 2 parameters have been developed, beta and lambda, which are simple functions of a, and are directly related to each other. Beta is called the 'heating coefficient' and is thought indicative of the rate of change of net long-wave radiation loss per unit increase in net solar radiation. It is argued that if these parameters are valid, they must have either statistical or descriptive usefulness. Net radiation, solar radiation, evaporation and albedo were measured over a variety of natural surfaces including drying sudangrass, regularly irrigated sudangrass, bare soil, differential heights of sudangrass and differential heights of alfalfa. Data analysis indicates neither parameter is either statistically or descriptively sound. Probably no single parameter could capably describe interactions of the relevant phenomena, radiant, latent and sensible heat exchange, at a natural surface. (Casey-Arizona)
W71-10480

EFFECT OF DECREASED RATE OF WATER ABSORPTION ON WATER BALANCE OF LEAF TISSUE,
Czechoslovak Academy of Sciences, Institute of Experimental Botany, Prague Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky.
Jana Pospisilova.
Biologia Plantarum (Praha), Vol 12, No 6, p 395-400, 1970. 3 fig, 12 ref.

Descriptors: *Leaves, *Water balance, *Absorption, *Transpiration, Laboratory tests, Osmotic pressure, Solutes, Moisture deficit, Plant physiology, Gravimetric analysis, Moisture content.
Identifiers: *Water potential, *Water saturation deficit.

By increasing water saturation deficit (WSD) in one part of a leaf, changes in water potential through the leaf may affect transpiration. Segments of kale (Brasicca oleracea) leaves were exposed to concentrations of polyethyleneglycol, varying from 0.25-1.0 M and mannitol at 0.5 M water absorbed on 1 side of the segment was transported through the middle segment to the opposite side and transpired there. At the various levels of solution osmotic potential, measurements were made of transpiration rate, water absorption rate and average values of WSD. Leaf water absorption decreased to zero at 0.25 M solute concentration, and flow reversed from the leaf to the solution at 0.50 M. Transpiration rates of all samples differed only slightly from controls. WSD increased significantly only in the absorbing part of the leaf. Water potential, during pure water absorption, decreased with distance from the absorbing surface. In solute solutions it showed a maxima in the transporting section of the leaf, decreasing to minima on opposite sides. (Casey-Arizona)
W71-10489

STUDIES IN STOMATAL BEHAVIOR. EFFECTS OF MOVING CARBON DIOXIDE FREE AND STILL AIR ON THE STOMATA OF SOME PLANTS,
U. A. R. Ain Shams Univ., Cairo (Egypt). Dept of Botany.
For primary bibliographic entry see Field 02I.
W71-10492

EVAPORATION OF CONTAMINATED AND PURE WATER DROPLETS IN A WIND TUNNEL,
Nevada Univ; Reno. Desert Research Inst.
For primary bibliographic entry see Field 02B.
W71-10785

POTENTIAL USEFULNESS OF ANTITRANSPIRANTS FOR INCREASING WATER USE EFFICIENCY IN PLANTS, II. APPLIED INVESTIGATIONS WITH ANITRANSPIRANTS,
California Univ., Davis. Dept. of Water Science and Engineering.

David C. Davenport, Paul E. Martin, Robert M. Hagan, and Mary Ann Fisher.
Available from the National Technical Information Service as PB-201 949, $3.00 in paper copy, $0.95 in microfiche. Research Project Technical Completion Report, UCAL-WRC-W-174-II, 1971. 49 p, 36 fig, 27 tab, 26 ref. OWRR Project B-054-CAL (2).

Descriptors: *Water conservation, *Soil-water-plant relationships, *Evapotranspiration control, *Transpiration control, Plants, Chemcontrol, Thin films, Application methods, Water loss, Moisture content, Retardants, Surface tension, Hydrometry, Photosynthesis, Vegetation, Leaves, Consumptive use.
Identifiers: Water balance control (Plants).

Antitranspirants retarded the rates of water use by oleanders grown along California's highways, and therefore have a potential for reducing the frequency of their irrigation as well as the associated costs and hazards. Antitranspirants also showed a potential for reducing the watering requirements of turf grass. Apart from water conservation, antitranspirants also proved useful in improving plant performance by increasing plant water potential. Thus, (1) survival of transplanted seedlings was increased; (2) water potentials in fruit trees were raised, leading to higher growth rates of fruit, final volumes of peaches being increased by 8% and of olives by 13%; (3) shoot growth of oleanders was increased, but this could be partly offset by incorporating a growth retardant (Alar) in the spray. Antitranspirants decreased vegetative growth and yield of an annual field crop (snap beans), but also had the effect of delaying the maturity of the crop. Miscellaneous investigations included attempts to reduce blossom drop of beans, increase the life of cut Christmas trees, reduce lettuce tip burn, reduce the cracking of prune and cherry fruit, and increase the shipping life of bedding plants and the vase life of roses. (See also W71-05443)
W71-10804

MASS TRANSFER FROM ROUGH SURFACES,
Colorado State Univ., Fort Collins. Coll. of Engineering.
Shashi B. P. Verma.
Ph D Thesis, April 1971. 184 p, 79 fig, 10 tab, 89 ref, 2 append. OWRR Project B-015-COLO (2).

Descriptors: *Evaporation, *Mass transfer, *Model studies, Velocity, Humidity, Dimensional analysis, Boundary processes, Advection, Energy transfer, Winds, Meteorology, Topography, Roughness coefficient.
Identifiers: Wind tunnels.

An experimental investigation of the problem of mass transfer from rough surfaces, particularly by evaporation, is described. Sinusoidal wavy surfaces of three different sizes were used to represent a controlled and defined shape of roughness. Simultaneous measurements were made of the mean velocity, humidity, and temperature distributions. In the region far downstream of the leading wave, where the equilibrium boundary layer conditions were achieved, the average mass transfer coefficient was a simple power function of the surface Reynolds number. Based on this result, the mass transfer data correlated well with the mass transfer data from surfaces of various other geometries, including evaporation data from water waves, evaporation data from flat plate and sublimation data from surfaces roughened with irregular pyramids and spanwise humps. (Knapp-USGS)
W71-10913

2E. Streamflow and Runoff

OBSERVATIONS ON STREAM DISCHARGE AND COMPETENCE AT MOSAIC CANYON, DEATH VALLEY, CALIFORNIA,
Durham Univ. (England). Dept. of Geography.
P. Beaumont, and T. M. Oberlander.
Geological Society of America Bulletin, Vol 82, No 6, p 1695-1698, Jun 1971. 4 p, 2 fig, 1 tab, 2 ref.

Descriptors: *Alluvial channels, *Sediment transport, *Stage-discharge relations, *Particle size, *Bed load, Supercitical flow, Velocity, Ephemeral streams, Braiding, Sand waves, Deserts, Scour, Erosion, Sedimentation, Rainfall-runoff relationships, California.
Identifiers: Death Valley (Calif).

In late November 1970, in the Death Valley region, a Pacific depression moving eastward over the area brought 0.81 in. of precipitation at Furnace Creek in 24-hr. By 1300 hours on November 30, runoff was beginning to occur over a considerable portion of the region, both in the watershed areas and also on the surface of the alluvial fans. Runoff appeared to be greatest on the western side of the valley. At the apex of the fan, water discharge was taking place along the stream channel, which at this point is incised between 4 and 10 ft below the general level of the fan and has a total width of between 90 and 110 ft. Water flow was concentrated in a series of rapidly changing braided channels up to about 10 ft in width, occurring across the floor of the main wash. In the larger channel, the maximum velocity observed was 6.65 ft per sec, while in the smaller channel, the value was only 3.50 ft per sec. Using these figures, the discharge through the larger channel was estimated at 26.6 cu ft per sec and through the smaller channel at 4.4 cu ft per sec. Total discharge was 31.0 cu ft per sec at the time of observation. The largest sediment sampled had a long axis of 8.4 in and the smallest 4.3 in. The weight of the stones varied from a minimum of 1.34 lbs to a maximum of 5.06 lbs while volumes varied from 12.2 cu in to 51.3 cu in. Even with small discharges and shallow-water depths, stones of moderate size cna be transported when channel slopes are sufficient to allow high-velocity flow conditions to occur. (Knapp-USGS)
W71-10454

THE IRROTATIONAL THEORY OF ANNULAR SOLITARY WAVES,
Engineering Labs., Cambridge (England).
For primary bibliographic entry see Field 08B.
W71-10470

PRESSURE AND VELOCITY DISTRIBUTION FOR SHARP-CRESTED WEIRS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-10474

THEORY OF DIMENSIONS AND SPURIOUS CORRELATION,
Queen's Univ. Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-10475

COMPUTED FLOOD PROFILE-RIVER DES PERES, GROBY STREET TO 82nd BOULEVARD, UNIVERSITY CITY, ST. LOUIS COUNTY, MISSOURI,
Geological Survey, St. Louis, Mo.
Donald W. Spencer.
Geological Survey Open-file Report, January 1971. 14 p, 6 fig, 4 tab.

Descriptors: *Streamflow, *Floods, *Urbanization, *Hydrologic data, *Missouri, Mathematical studies, Computers, Data processing, Flood plains, Environmental effects, Reviews, Data collections, Cities, Flood control, Backwater, Water levels, Topography, Elevation.
Identifiers: *Urban hydrology, *Flood profiles, *St. Louis County (Mo), Flood profile computations.

Flood profiles are computed on River Des Peres, in the reach between Groby Street and 82nd Boulevard in University City, St. Louis County, Mo., for original conditions (about 1957), for construction from 1959-1968, for construction in 1969, and for presently proposed construction. Extensive construction has taken place on the flood plains between Hafner Place and Olive Street and immediately downstream from Olive Street since 1959. The effects of the construction on flood levels are presented. Water levels were computed at 17 points for four given stages of development and for two flood magnitudes. These levels were computed by an electronic computer using step-backwater procedures and are shown in graphical form. (Woodard-USGS)
W71-10572

A PROPOSED STREAMFLOW DATA PROGRAM FOR LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 07A.
W71-10574

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS, METROPOLITAN AREA, 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-10583

DEVICES FOR CALCULATING AND MEASURING WATER FLOW IN WATER MANAGEMENT SYSTEMS (Pribory dlya ucheta i izmereniya raskhoda vody na gidromeliorativnykh sistemakh),
A. Ye. Pogodayev.
Gidrotekhnika i Melioratsiya, No 3, p 67-73, March 1971. 7 p, 11 fig.

Descriptors: *Discharge measurement, *Flow measurement, *Flowmeters, Flow, Water supply, Discharge (Water), Manometers, Gages, Equipment, Design data, Specifications, Irrigation systems, Drainage systems.
Identifiers: *USSR, Soviet design data.

A technical description, accompanied by photos and diagrams, is given for several recently designed devices for the measurement of stream velocities. These include (1) a bellows-type differential manometer developed by the Southern Scientific Research Institute of Hydraulic Engineering and Reclamation (size--2,000x400x630 mm, discharge--50-100,000 liter/sec); (2) a recording flowmeter, designed by the Ukrainian Scientific Research Institute of Hydraulic Engineering and Reclamation (size--230x135x160 mm, weight --2.1 kg); and (3-4) a unipolar microflowmeter (range of measurable velocities --2-150 cm/sec, maximum size --222x142x83 mm, weight of complete unit -- 2 kg) and a multiple arrangement (range of measurable velocities --2-300 cm/sec, size and weight of amplifier unit 400x340x210 mm, 10 kg), developed by the Minsk Scientific Research Institute of Water Research and designed to measure flow velocities under laboratory and field conditions. The devices are presently on display at the pavilion 'Reclamation and Water Management' of the USSR Exhibition of Achievements of the National Economy. (Josefson-USGS)
W71-10587

UNSTEADY INERTIAL EFFECTS IN FLUID FLOW THROUGH POROUS MEDIA,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 8B.
W71-10643

WATER-DROP--SURFACE-WAVE INTERACTIONS,
California Univ., Los Angeles. Dept. of Meteorology.
For primary bibliographic entry see Field 08B.
W71-10702

ACTIVE VALLEY MEANDERS IN SOUTH-CENTRAL TEXAS AND THEIR WIDER IMPLICATIONS,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
K. J. Tinkler.
Geological Society of America Bulletin, Vol 82, No 7, p 1783-1799, Jul 1971. 17 p, 9 fig, 2 tab, 19 ref.

Descriptors: *Meanders, *Channel morphology, *Stage-discharge relations, *Alluvial channels, Geomorphology, Erosion, Scour, Sediment transport, Flood plains, Paleohydrology, Texas, Streamflow, Valleys.
Identifiers: Valley meanders.

Active valley meanders may be identified in fossil form. A detailed study of a small catchment in Texas shows the channel morphology and valley floor to be in equilibrium. The implications of the active valley meanders are compared with fossil meander forms in high latitudes in terms of the normal development of a fluvial landscape with incising streams. The appearance of a flood-plain may be independent of the hydrological regime of a basin and it may be the cause of a reduction in flow effectiveness rather than the result of a reduction in flow. Effective flows in valley meander formation have a recurrence interval from 10 to 50 yrs. This constitutes a channel-full flow that shapes the meanders. Mistaken identification of such flows may have led to overestimates of past discharges and climatic parameters. (Knapp-USGS)
W71-10706

OSCILLATIONS IN A BAY OF ARBITRARY SHAPE AND VARIABLE DEPTH,
Los Alamos Scientific Lab., N. Mex; and Tetra Tech Inc., Pasadena, Calif.
Kenneth Olsen, and Li-San Hwang.
Journal of Geophysical Research, Vol 76, No 21, p 5048-5064, July 20, 1971. 17 p, 15 fig, 2 tab, 15 ref.

Descriptors: *Waves (Water), *Bays, *Seiches, Frequency analysis, Instrumentation, Wave pile-up, Ocean waves, Surf, Frequency, Surges.
Identifiers: Wave run-up.

Ocean waves having periods between four minutes and about one hour were simultaneously measured at several locations inside Keauhou Bay, Hawaii, and at two deep-water stations approximately 4 km offshore. Comparison of these records show amplifications of as much as 1,000 (in power spectral density) at selected frequencies. A theoretical method was developed for determining the amplification factors for bays of arbitrary shape and variable depth. The method for obtaining the bay oscillation does not require prescribing the boundary condition at the entrance. The theory can account for most of the observed amplification factors, but shelf resonance and edge-wave effects seem to play a significant and interesting role for periods somewhat longer than the fundamental bay resonance period. (Knapp-USGS)
W71-10712

GENERALIZED FLOOD-FREQUENCY ESTIMATES FOR URBAN AREAS IN MISSOURI,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 04C.
W71-10714

THE RIVER PROFILE,
Florida State Univ., Tallahassee. Dept. of Geology.
William F. Tanner.
Journal of Geology, Vol 79, No 4, p 482-492, July 1971. 11 p, 14 ref.

Descriptors: *Geomorphology, *Channel morphology, *Profiles, *Alluvial channels, *Mathematical models, Streams, Sediment transport, Sedimentation, Erosion, Equations, Bed load.
Identifiers: *River profiles.

The long profile of a representative natural stream is composed of segments, each of which is exponential, or nearly so. Each segment tends to plot on semilog paper (distance vs. log elevation) as a straight line, with a faint upward convexity near the upper end of the segment, and a faint upward concavity near the lower end of the segment. These small, but real, departures from the straight-line plot require a refinement of the classical profile equation, dA/dz — kA. Several modifications are proposed, and are explored mathematically. One attempts to separate dynamic sorting of bed load from attrition effects. Another (expressed initially as Lagrange's linear equation) treats the development of the two-dimensional profile with time-varying uplift. A third is the Leopold-Langbein random-walk model. A fourth is a modified random-walk model which specifically includes the upstream convexity and which can be altered to include the downstream concavity. A fifth is Devdariani's heat-flow analogy, which seems to be too general, but which can be forced, arbitrarily, to describe many anomalies of curvature. Three more are nonlog profiles based on reasoning associated with precipitation or discharge effects. No one of the attempts is completely successful, but each helps to explain the overall problem. (Knapp-USGS)
W71-10730

WATER RESOURCES DATA FOR KANSAS, 1970, PART 1. SURFACE-WATER RECORDS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 07C.
W71-10811

WATER RESOURCES OF NORTHEASTERN MISSOURI,
Geological Survey, Washington, D.C.; AND Missouri Geological Survey and Water Resources, Rolla.
For primary bibliographic entry see Field 07C.
W71-10825

PRESENT METHODS AND PROSPECTS FOR COMPUTING MAXIMUM FOOD RUNOFF (O metodakh rascheta maksimal'nykh pavodkov. Sostoyaniye i perspektivy razvitiya),
Gidrometeorologicheskii Institut, Leningrad (USSR).
D. L. Sokolovskiy, and I. A. Shiklomanov.
In: Meteorologiya, Gidrologiya Vod Sushi i Okeanologiya, Leningradskiy Gidrometeorologicheskiy Institut Trudy, No 39; p 149-162, 1970. 1 tab, 23 ref.

Descriptors: *Synthetic hydrology, *Analytical techniques, *Flood forecasting, *Runoff, *Mathematical models, Model studies, Analog computers, Analog models, Flood routing, Unit hydrographs, Peak discharge, Precipitation (Atmospheric), Time lag.
Identifiers: *USSR, Soviet Far East, European USSR, Isochrones, Traveltime.

All existing methods of computing maximum flood runoff may be divided into two types: analytical (maximum precipitation intensity formulas, empirical, and volumetric formulas) and genetic (isochrones, unit hydrographs, mathematical modeling, and analog modeling). The advantages and disadvantages of the various methods are discussed in the light of their future application to engineering practice. Examples of the use of mathematical models for computing flood runoff are based on a study of the European USSR, with basin areas ranging in size from 0.70 to 20,000 sq km and with time periods ranging from 10 min to 24 hours. Plans for improving and developing the genetic methods of defining flood hydrographs by mathematical modeling include adjustments for the effects of water yield, type of flood, and hydrographic characteristics of the basin. (Josefson-USGS)
W71-10826

ROLE OF CHEMICAL PRECIPITATION IN FORMING THE COMPOSITION OF STREAMFLOW (K voprosu o roli khimicheskogo sostava atmosfernykh osadkov v formirovanii sostava rechnykh vod).
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02K.
W71-10827

INVESTIGATIONS OF MAXIMUM STORM RUNOFF ON RIVERS OF THE SOVIET FAR EAST BY THE ENGINEERING HYDROLOGY DEPARTMENT OF THE LENINGRAD HYDROMETEOROLOGICAL INSTITUTE (Ob issledovaniyakh maksimal'nogo dozhdevogo stoka na rekakh Dal'nego Vostoka kafedroy inzhenernoy gidrologii),
Gidrometeorologicheskii Institut, Leningrad (USSR). Leningrad Hydrometeorological Inst., USSR.
I. F. Goroshkov, V. G. Orlov, A. A. Samokhin, and N. N. Solov'yeva.
In: Meteorologiya, Gidrologiya Vod Sushi i Okeanologiya, Leningradskiy Gidrometeorologicheskiy Institut Trudy, No 39; p 163-178, 1970. 3 tab, 26 ref.

Descriptors: *Storm runoff, *Floods, *Rainfall-runoff relationships, Storms, Precipitation (Atmospheric), Climatic data, Meteorological data, Water levels, Seasonal, Typhoons, Historic flood, Discharge (Water), On-site investigations, On-site data collections, Probability.
Identifiers: *USSR, Soviet Far East, Amur River, Maritime Territory, Sakhalin, Kamchatka.

Studies of maximum storm runoff on rivers of the Soviet Far East were begun in 1958 in the flood-risk regions of the Amur River basin, in the Maritime Territory, Sakhalin and Kamchatka. Based on on-site investigations of small streams, records of past floods and rainfall-runoff relationships, an empirical reduction formula was obtained for determining maximum discharges of storm floods of 1% probability for ungaged streams. A coefficient of variation, expressed as a function of basin area, may be used to convert maximum discharges of 1% probability to maximum discharges of other probabilities. Recommendations for computing maximum discharges of storm floods for individual regions of the Soviet Far East, based on 10 years of research by the Leningrad Hydrometeorological Institute, are being adopted by leading hydrologic organizations in their planning of hydraulic structures on ungaged rivers. These organizations include the USSR State Institute for the Planning and Surveying of Highways of the State Industrial Committee for Transportation Construction (Soyuzdorproyekt) and the Leningrad Branch of the All-Union Planning, Surveying and Scientific Research Institute (Gidroproyekt). (Josefson-USGS)
W71-10829

METEOROLOGY, CLIMATOLOGY AND HYDROLOGY (Meteorologiya, klimatologiya i gidrologiya).
For primary bibliographic entry see Field 02B.
W71-10834

USER'S MANUAL FOR THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL IV,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-10878

2F. Groundwater

A SIMPLIFIED APPROACH TO WATER INFLUX CALCULATIONS – FINITE AQUIFER SYSTEMS,
Phillips Petroleum Co., Bartlesville, Okla.
M. J. Fetkovich.
Journal of Petroleum Technology, p 814-828, July 1971. 15 p, 21 fig, 5 tab, 30 ref, append.

Descriptors: *Groundwater movement, *Water balance, *Oil fields, Water pressure, Water yield, Equations, Oil reservoirs, Aquifer characteristics, Injection.

The PI-Aquifer Material Balance approach to water influx calculations is useful for forecasting and analyzing the performance of water-drive gas and oil reservoirs. It utilizes a productivity index for the aquifer and an aquifer material balance. Calculations are simple and straightforward, requiring no superposition. Results indicate that for normal reservoir engineering problems, the simplified approach will give results equivalent to the more rigorous solutions. (Knapp-USGS)
W71-10452

GEOCHEMICAL STUDIES ON CONTINENTAL WATERS. ANNUAL REPORT AND RENEWAL PROPOSAL,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
Wallace S. Broecker, and David L. Thurber.
Available from the National Technical Information Service as CU 2493-11, $3.00 in paper copy, $0.95 in microfiche. Geochemical Studies of Continental Waters, CU 2493-11. 6 append.

Descriptors: *Geochemistry, *Aquifer characteristics, *Water chemistry, *Chemical properties, *Hydrology, Tritium, Water vapor, Waste dilution, Saline lakes, Sediments, Oceans, Groundwater, Baseflow, Diffusion, Dispersion, Temperature gradient, Water pollution, Distribution patterns.
Identifiers: Surface waters, Crater Lake, Vapor exchange, Lake Tahoe, Dilute lakes, Cranberry Lake, Sterling Lake, Mono Lake.

Geochemical studies of continental waters are presented in six appendices. Tritium in Crater Lake, Oregon, is a report on concentration of the lake by precipitation and vapor exchange process. The chemistry and hydrology of a dilute lake are reported as a useful tool in geochemistry. A comparison is made of the chemistry and hydrology of a closed lake vs. that of an ocean. Measurement of ground water flow by use of a tracer is reported. Measurements for ionic balance was made in Cranberry and Sterling Lakes. Factors that control the chemistry of water and the processes responsible for the cycling and transport of pollutants are discussed. Other studies reported included measurement of radon in groundwater and gas exchange rates and vertical mixing processes in lakes. (Houser-NSIC)
W71-10636

OGALLALA AQUIFER SYMPOSIUM,
Texas Tech Univ., Lubbock. Dept. of Geosciences.

Texas Tech University, International Center for Arid and Semi-Arid Land Studies, Special Report No. 39, 1970, 242 p.

Descriptors: *Water supply, *Economic impact, *Water management (Applied), *Geology, *Groundwater, Texas, Reviews, Waste disposal, Natural recharge, Drainage, Simulation analysis, Digital computers, Numerical analysis, Dynamic programming, Specific yield, Permeability, Artificial recharge, Geohydrology, Logging (Recording).
Identifiers: *Ogallala Aquifer, High Plains.

This publication is a collection of 20 papers presented at a 1970 Symposium on the Ogallala Aquifer. The formation furnishes agricultural, domestic and municipal water to a one-quarter million square-mile area, and is one of the nation's major water-bearing units. The aquifer extends from the northern High Plains to central West Texas, where livestock, grain and fiber are produced by the management of the Ogallala. The purpose of this symposium is to provide a unified picture of the work accomplished and to define areas of additional research need on the geohydrological problems of the formation. Papers include significance, review, geology, groundwater resources, waste disposal, well logging, natural recharge, linearity, drainage analysis, digital simulation, numerical modeling, dynamic modeling, specific-yield determination, estimation of coefficient of permeability, water transfer, assessments, herbicide movement, and artificial groundwater recharge of the Ogallala Aquifer. (See also W71-08349 thru W71-08357 and W71-10678 thru W71-10687) (Popkin-Arizona)
W71-10677

BASIN RECHARGING THE OGALLALA AQUIFER THROUGH PLEISTOCENE SEDIMENTS, TEXAS HIGH PLAINS,
Agricultural Research Service, Bushland, Tex.
For primary bibliographic entry see Field 04B.
W71-10683

APPLICATION OF SURFACE PRESSURE TO ASSIST WATER RECHARGE INTO THE OGALLALA FORMATION,
Texas Tech Univ., Dept. of Petroleum Engineering, Lubbock.
For primary bibliographic entry see Field 04B.
W71-10684

THE TEXAS WATER DEVELOPMENT BOARD COOPERATIVE STUDIES OF THE OGALLALA UNDERGROUND RESERVOIR,
Gunnar Brune.
In: Ogallala Aquifer Symposium, Texas Tech University, International Center for Arid and Semi-Arid Land Studies, Special Report No. 39, 1970, p 227-242. 9 fig, 13 ref.

Descriptors: *Storage capacity, *Recharge wells, *Groundwater recharge, *Water transfer, *Artificial recharge, Reservoirs, Water utilization, Water storage, Irrigation practices, Irrigation wells, Groundwater mining, Evaluation, Aquifers, Runoff, Water management (Applied), Recharge, Discharge (Water), Maps, Economic efficiency, Texas.
Identifiers: *Ogallala Groundwater Reservoir, *Texas Water Development Board, Southern High Plains (Texas).

The Ogallala groundwater reservoir, which furnishes 73% of the groundwater and 53% of the total amount of water used in Texas in 1968, represents 51% of the total water storage capacity available in the state. About 134 million acre-feet of unsaturated storage capacity is available in the southern High Plains, where the average acreage irrigated per well declined from 140 acres in 1954 to 84 in 1969. There are 166 known farm recharge wells, and many city and industrial facilities in operation. The Texas Water Development Board is concerned about declining groundwater supplies in the area, and has undertaken 2 cooperative studies involving the Ogallala. One study, with the High Plains Research Foundation, will evaluate effects on the aquifer using runoff water as recharge. Groundwater quality and quantity will be monitored. The other study, with the U.S. Geological Survey, contemplates the use of the Ogallala for underground storage and transmission of imported and local surface water. Structural, lithological, permeability, recharge and discharge maps will be prepared. Areas of potentially successful, large-scale artificial recharge will be delineated, and the best recharge method for each situation will be evaluated. Some historical and related projects by the Board are summarized. (Popkin-Arizona)
W71-10687

GROUNDWATER RESOURCES OF THE MORA RIVER DRAINAGE BASIN WITHIN WESTERN MORA COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 04B.
W71-10725

THE USE OF MOMENTS FOR MAPPING VERTICAL VARIABILITY OF CRETACEOUS AQUIFERS IN MISSISSIPPI,
Mississippi State Univ., State College. Dept. of Geology and Geography.
Donald M. Keady.
Available from the National Technical Information Service as PB-201 730, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Mississippi Water Resources Research Institute, State College, 1971, 37 p, 14 fig, 1 tab, 6 ref. OWRR Project A-045-MISS (1).

Descriptors: *Groundwater, Hydrogeology, Aquifers, Mississippi, *Aquifer characteristics, Mapping, Water wells, *Sands, *Electrical well logging, *Logging (Recording).
Identifiers: *Moments method, Ctetacceous aquifers, Vertical variability.

The moment method was used to describe and map the vertical variability of fresh-water sands within the Cretaceous aquifer systems (Lower Cretaceous, Coker-Massive, Gordo, Eutaw-McShan, Coffee, and Ripley) in a 20-county area in northeastern Mississippi. The position and thickness of the fresh-water sands were determined from a study of 126 electrical logs of water wells and oil tests. The distribution of the sands in each system was described by calculating moments using the thickness of the sand as the moment weight and the distance to its center as the moment arm. The moment data were used to define the center of gravity, standard deviation, skewness, and kurtosis, and these statistical values were contoured to show the areal variation. The contours for the center of gravity tend to parallel the dip and strike of the formations, and the standard deviation reflects the range of sand occurrence within the aquifer system. Skewness and kurtosis values indicate that none of the distributions follows a normal probability distribution; therefore, statistical interferences concerning the distribution of the sands within an aquifer system must be modified.
W71-10760

EVALUATION BY TEST DRILLING OF GEOPHYSICAL METHODS USED FOR GROUNDWATER DEVELOPMENT IN THE PIEDMONT AREA, ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 04B.
W71-10806

SOME INVESTIGATIONS OF THE DEPOSITION OF TRAVERTINE FROM HOT SPRINGS - 1. THE ISOTOPIC CHEMISTRY OF A TRAVERTINE-DEPOSITING SPRING,
Geological Survey, Denver, Colo.
Irving Friedman.
Geochimica et Cosmochimica Acta, Vol 34, No 12, p 1303-1315, December 1970. 13 p, 6 fig, 3 tab, 16 ref.

Descriptors: *Hot springs, *Travertine, *Geochemistry, *Wyoming, *Groundwater, Limestones, Geysers, Water temperature, Alkalinity, Carbon, Isotropy, Crystallography.
Identifiers: *Yellowstone National Park, *Mammoth Hot Springs (Wyo.).

The isotopic compositions of the travertine and of the hot spring solutions were studied at Main Springs and New Highland Terrace in the Mammoth Hot Springs area of Yellowstone Park. The springs issue at 74 deg and a pH of 6.65. The main object of the study was to determine the

fractionation that occurs between carbon in solution and carbonate precipitated as travertine. Other topics, such as the rates of precipitation of travertine, the polymorphic form of the travertine, the chemistry and pH of the spring waters, the isotopic composition of 'fossil' travertine, and the isotopic composition of possible source carbonates, were investigated. Calculations based on pH and alkalinity titrations show that at the spring orifice the water is very high in free CO2, which is quickly lost in transit. The springs are supersaturated with respect to both aragonite and calcite during most of their travel in the open air. The carbon isotopic composition of the travertine is similar to that in the marine carbonates that are adjacent to the springs and that are the probable source of the calcium carbonate. (Woodard-USGS)
W71-10814

PERMEABILITIES OF PRECAMBRIAN ONVERWACHT CHERTS AND OTHER LOW PERMEABILITY ROCKS,
Stanford Univ., California. Dept. of Petroleum Engineering; and National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
S. K. Sanyal, K. A. Kvenvolden, and S. S. Marsden, Jr.
Nature, Vol 232, No 5309, p 325-327, July 30, 1971. 3 p, 1 tab, 15 ref.

Descriptors: *Groundwater movement, *Rock properties, *Permeability, *Precambrian Eras, *Geomorphology, Geology, Flow profiles, Fluid friction, Porosity, Pressure, Confined water.

Quantitative estimates of rock permeability are of importance in any branch of science or engineering where flow of fluids through rocks is considered. For the permeability measurements in this report, hydraulic oil was used in both the hydraulic and thermal pumps. Theoretically permeability of a rock is independent of the flowing fluid but in practice this independence is not strictly valid. Extremely low permeability rocks have a higher permeability to air than to water. This difference may be due to dehydration of minerals in contact with flowing air (causing an increase in permeability), or the swelling of clay minerals in contact with flowing water which would cause a decrease in permeability. The second effect can be minimized by use of strong brine or a non-interacting fluid such as hydraulic oil. Permeability and porosity values of the samples studied as well as directions of permeability measurements and confining pressures are listed. (Woodard-USGS)
W71-10817

WATER RESOURCES OF NORTHEASTERN MISSOURI,
Geological Survey, Washington, D.C.; AND Missouri Geological Survey and Water Resources, Rolla.
For primary bibliographic entry see Field 07C.
W71-10825

2G. Water in Soils

SOME EROSIONAL FEATURES DUE TO PIPING AND SUB-SURFACE WASH WITH SPECIAL REFERENCE TO THE SUDAN,
University Coll., Dar-es-Salaam (Tanzania). Dept. of Geography.
Len Berry.
Geografiska Annaler, Vol 52A, No 2, p 113-119, 1970. 5 fig, 1 tab, 20 ref.

Descriptors: *Soil erosion, *Collapse, *Geomorphology, *Arid lands, *Soil water movement, *Soil texture, Soil stability, Soil profiles, Subsurface flow, Subsurface waters, Vegetation effects, Alluvium, Colluvium, Grasses, Semiarid climates, Streams.
Identifiers: *Sudan, *Piping.

Subsurface water movement occurs in 2 distinct ways: as a sheet through a porous medium or as a linear flow along joint, pore and bedding directions. Lateral movement can operate through a thicker zone than vertical movement with a resulting greater effect on subsurface and surface geomorphology. In alluvium and colluvium this may result in either collapse features or development of defined and incised stream channels. Collapse forms are described for a number of arid and semiarid regions of the Sudan; usually they are found in areas of tufted perennial grasses, and occasionally may have been used or even formed by burrowing animals. It is suggested that subsurface material removal may be important in the overall lowering of relief in certain gently sloping areas and in stream course development in semiarid areas. (Casey-Arizona)
W71-10485

THE FRAGIPAN MENACE AND COMPREHENSIVE PLANNING IN MEGALOPOLIS,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-10510

USE OF A NEUTRON MOISTURE METER (NIV-1) FOR DETERMINING THE MOISTURE CONTENT OF RED EARTHS (Ispol'zovaniye neytronnogo vlagomera (NIV-1) dlya opredeleniya vlazhnosti krasnozemov),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
L. I. Beskin, L. A. Karmanova, and A. I. Romashkevich.
Pochvovedeniye, No 2, p 97-101, February 1970. 5 p, 2 fig, 1 tab, 6 ref.

Descriptors: *Nuclear moisture meters, *Soil moisture meters, *Soil moisture, *Moisture content, Moisture meters, Instrumentation, Nuclear meters, Calibrations, Subtropic, Wet climates, Wet seasons.
Identifiers: *USSR, *Red Earths, Batumi, Adzhar ASSR, Wet soils.

The possibility of using an NIV-1 instrument in moisture determinations of Red Earth soils of the Batumi Botanical Garden, Adzhar ASSR, is examined. Replacement of the lead screen in the probe by a tungsten one widened the range of moisture measurements to 55% (by volume). The modernized instrument was found to operate stably and may be recommended for studying the moisture regime of many wet soils. (Josefson-USGS)
W71-10592

WATER-RETAINING CAPACITY OF LOAMY SAND CHESTNUT SOILS OF THE KULUNDA STEPPE (Vodouderzhivayushchaya sposobnost' supeschanykh kashtanovykh pochv Kulundinskoy stepi),
Novosibirsk Inst. of Agrochemistry and Soil Science (USSR).
V. P. Panfilov, and N. I. Chashchina.
Pochvovedeniye (Soil Science), No 12, p 62-72, December 1970. 11 p, 3 fig, 6 tab, 26 ref.

Descriptors: Soil physics, *Retention, *Moisture content, *Soil moisture, *Chestnut soils, Soil water, Capillary action, Particle size, Water storage, Irrigation, Dry farming, Soil physical properties, Porosity, Pores, Wilting point.
Identifiers: *USSR, Kulunda Steppe, Moisture capacity, Growing season.

The mechanism and nature of water retention of loamy sand Chestnut soils in the Kulunda Steppe and the results of detailed investigations conducted in connection with development of irrigation of the area are discussed. An equilibrium moisture content was found to set in 20 days after irrigation and amounted to 8-9% of dry soil weight, or 130 mm of water in the 0- to 100-cm layer. This moisture content corresponds to the true minimum moisture capacity of the soils under study. At this moisture level the water is retained by capillary forces. The true minimum moisture capacity, on which water storage depends, must be taken into account in irrigated and dryland agriculture (Josefson-USGS)
W71-10595

TEMPERATURE AND MOISTURE REGIME OF MEADOW-SOD SOILS IN THE SOUTHERN PART OF SAKHALIN (Rezhim temperatury i vlazhnosti lugovo-dernovykh pochv yuzhnoy chasti Sakhalina),
Sakhalin Kompleksnyi Nauchno-Issledovatelskii Institut, Yuzhno-Sakhalinsk (USSR).
I. S. Fedorov.
Pochvovedeniye (Soil Science), No 12, p 73-82, December 1970. 10 p, 2 fig, 7 tab, 27 ref.

Descriptors: *Soil moisture, *Frozen soils, *Soil temperature, *Water table, Groundwater, Moisture deficit, Cold regions, Evapotranspiration, Moisture content, Seasonal, Plant growth, Particle size, Wilting, Precipitation (Atmospheric).
Identifiers: *USSR, Sakhalin Island, Meadow-Sod soils, Growing season, Chronoisopleths, Thermoisopleths, Moisture capacity.

Meadow-Sod soils, like all other soils of southern Sakhalin, are frozen for long periods of time and remain cold in summer. Soil temperature varies little with depthand its annual range of variation is small. The high groundwater table and abundant precipitation in the fall result in considerable accumulation of water in both the freezing and nonfreezing layers. The ample water accumulated in winter and the heavy and frequent precipitation in summer maintain the soil moisture content at a high level during the warm period. A moisture deficit is rarely observed and only in the plow layer. (Josefson-USGS)
W71-10597

EFFECT OF IRRIGATION ON THE SALT REGIME OF TERRACED CHERNOZEMS OF THE TRANS-VOLGA REGION (Vliyaniye orosheniya na solevoy rezhim terrasovykh Chernozemov Zavolzh'ya),
Kuybyshev Agricultural Inst. (USSR).
For primary bibliographic entry see Field 05C.
W71-10598

APPLICATION OF THE NATURAL ELECTRIC FIELD METHOD TO A STUDY OF FILTRATION IN SOILS (O primenenii metoda yestestvennogo elektricheskogo polya pri izuchenii fil'tratsii v pochvo-gruntakh),
Moscow State Univ. (USSR). Dept. of Soil Biology.
L. B. Borovinskaya.
Pochvovedeniye (Soil Science), No 11, p 29-35, November 1970. 7 p, 3 fig, 5 ref.

Descriptors: *Electrical well logging, *Electric fields, *Filtration, *Soil physics, Hydraulic gradient, Zeta potential, Potential flow, Groundwater movement, Capillary action, Diffusion, Darcys law, Zone of saturation, Pressure head, Sands, Clays.
Identifiers: *USSR, Volgograd, Volga River, Don River.

The formation of natural local electric fields during the flow of water in the soil (flow potentials) is described in connection with the use of these fields to study the character and direction of water filtration in soils. It is found from laboratory investigations and field observations in the Volga-Don area near Volgograd that electrical logging by the resistance method may be used to differentiate between filtration and diffusion fields. A direct relationship is established between the electric potential values and the filtration rate, which if developed further, may lead to the establishment of quantitative relationships between these factors. (Josefson-USGS)
W71-10599

A QUANTITATIVE MODEL OF THE MOVEMENT OF WATER IN THE PLANT-SOIL-ATMOSPHERE SYSTEM (Kolichestvennaya model' peredvizheniya vody v sisteme rasteniya-pochva-atmosfera),
Moscow State Univ. (USSR). Dept. of Soil Biology.
I. I. Sudnitsyn.
Pochvovedeniye (Soil Science), No 11, p 24-29, November 1970. 6 p, 2 fig, 7 ref.

Descriptors: *Soil physics, *Model studies, *Soil-water-plant relationships, Soil moisture, Soil water, Capillary conductivity, Thermodynamics, Water pressure, Transpiration, Plants, Evaporation, Chernozems, Wilting point, Water supply, Forecasting, Agronomic crops.
Identifiers: *USSR, Voronezh Oblast.

A quantitative model of the movement of water in the plant-soil-atmosphere system is derived, based on the laws of thermodynamics and the relationships between soil water pressure, the moisture conductivity coefficient of the soil, and relative transpiration. The model makes it possible to calculate the ratio between the water pressure in the soil and that in plant roots. Pot experiments, conducted at an agrometeorological observatory in the Voronezh Oblast, confirmed the validity of the model for wheat, oats, barley and corn. The proposed model offers great opportunities for modernizing methods of evaluating and forecasting the water supply to agronomic crops. (Josefson-USGS)
W71-10600

EFFECT OF THE DRAINAGE OF PEAT SOILS IN THE MESHCHERA LOWLAND ON THEIR WATER-AIR AND NUTRIENT REGIMES (Vliyaniye osusheniya torfyanykh pochv Meshcherskoy nizmennosti na ikh vodno-vozdushnyy i pishchevoy rezhimy),
D. G. Golovko.
Pochvovedeniye (Soil Science), No 12, p 127-141, December 1970. 15 p, 2 fig, 17 tab.

Descriptors: *Soil-water-plant relationships, *Drainage effects, *Peat, *Soil moisture, *Soil properties, Nutrient requirements, Biological properties, Land reclamation, Water table, Groundwater recharge, Harvesting, Bogs, Soil temperature, Fertilizers, Nitrates, Aeration, Root systems, Plant growth, Potatoes, Crop production.
Identifiers: *USSR, Meshchera lowland, Ryazan' Oblast, Peat soils, Mineralization, Growing season, Moisture capacity, Perennial grasses, Row crops.

Studies of Peat soils in the Meshchera lowland of the Ryazan' Oblast reveal that the most favorable soil moisture conditions for growing potatoes, grasses, and grain crops are achieved by very shallow drainage wherein the root zone is constantly recharged by groundwater. Under these conditions, yields increase 13-58% as compared with deep drainage. Although deep drainage produces a better air regime and more intense biological activity, it leads to excessive peat mineralization and to the formation of a large amount of nitrates, which are not utilized by plants and which are leached into the groundwater. The amount of nitrates formed in shallow-drained areas is sufficient for obtaining high yields. It is recommended that the lowland bogs in the central non-Chernozem belt be drained to an average depth of 100-110 cm in the growing season for potatoes, 78-85 cm for grain crops and 60-70 cm for perennial grasses. (Josefson-USGS)
W71-10601

SOIL MOISTURE AND TEMPERATURE REGIMES ON THE LUBRECHT EXPERIMENTAL FOREST,
Montana Univ., Bozeman. Joint Water Resources Research Center.
For primary bibliographic entry see Field 02I.
W71-10755

RELATIONSHIP BETWEEN MOISTURE POTENTIAL OF PEAT AND ITS MOISTURE CONTENT AND DEGREE OF COMPACTION (Zavisimost' potentsiala vlagi torfov ot vlagosoderzhaniya i stepeni uplotneniya),
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii; and Belorusski Nauchno-Issledovatelskii Institut Melioratsii i Vodnogo Khozyaistva, Minsk (USSR).
N. V. Churayev, and M. I. Svyattsev.
Pochvovedeniye, No 5, p 103-111, May 1970. 6 fig, 12 ref.

Descriptors: *Soil physics, *Soil moisture, *Moisture content, *Soil compaction, *Peat, Soil properties, Soil structure, Soil physical properties, Soil mechanics, Drainage, Soil pressure.
Identifiers: *USSR, Peat drainage, Soil shrinkage, Moisture potential.

Results of an experimental study of the moisture potential of a lowland peat sample as a function of its degree of compaction at constant moisture content and moisture content at constant compaction are discussed. An equation was obtained describing the dependence of the moisture potential on the structural and physico-mechanical properties of the peat as a function of its moisture content and degree of compaction. Moisture potential variations during peat drainage were computed, using the linear equation of volumetric shrinkage to describe the relationship between moisture content and compaction. (Josefson-USGS)
W71-10831

SALT ACCUMULATION IN SOILS AND GROUNDWATER OF IRRIGATED AREAS OF RIVER VALLEYS IN TADZHIKISTAN (Protsessy solenakopleniya v pochvenno-gruntovykh vodakh na oroshayemykh zemlyakh rechnykh dolin Tadzhikistana),
Tadzhik Scientific Research Inst. of Soil Science, Dushambe.
U. Tadzhiyev.
Pochvovedeniye, No 8, p 118-124, August 1970. 5 tab, 15 ref.

Descriptors: *Soil water, *Groundwater, *Salts, *Salinity, Land reclamation, Groundwater recharge, Water table, Irrigation effects, Water chemistry, Valleys, Irrigation water, Bicarbonates, Chlorides.
Identifiers: *USSR, Tadzhikistan, Yakhsu River, Kyzylsu River, Pyandzh River, Mineralization.

Valley types of salt accumulation were examined on the basis of large-scale soil maps and personal studies by the author in 1964-66 in the Yakhsu, Kyzylsu and Pyandzh river valleys of southeastern Tadzhikistan. It was found that salt accumulation in the soils and groundwater was associated with the structure of the river valleys and with local hydrologic conditions. The mineralization of these waters and their chemical composition varied with the source of groundwater recharge, the depth of the groundwater table and the effects of irrigation. A zonal shift in the chemical composition of the soil- and groundwater from a bicarbonate to chloride type of salinity confirms the assumption of geochemical patterns in salt accumulation and attests to their local development. (Josefson-USGS)
W71-10832

SOIL AS AN ANIMAL WASTE DISPOSAL MEDIUM,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 05G.
W71-10885

GROWTH RATE AND PHOSPHORUS UPTAKE OF WHEAT (TRITICUM AESTIVUM VILL., HOST) AS A FUNCTION OF SOIL WATER SUCTION AND SOIL TEMPERATURE,
Oregon State Univ., Corvallis. Dept. of Soils.
For primary bibliographic entry see Field 02I.
W71-10912

2H. Lakes

SALTON SEA, CALIFORNIA--WATER QUALITY AND ECOLOGICAL MANAGEMENT CONSIDERATIONS,
Federal Water Quality Administration, San Francisco, Calif. Pacific Southwest Region.
For primary bibliographic entry see Field 05G.
W71-10577

STUDY OF THE DISPERSION OF RADIOACTIVE EFFLUENTS INTO A LAKE - CONTAMINATION OF THE BOTTOM SEDIMENTS,
European Atomic Energy Community, Ispra (Italy). Protection Service.
For primary bibliographic entry see Field 05B.
W71-10603

GEOCHEMICAL STUDIES ON CONTINENTAL WATERS. ANNUAL REPORT AND RENEWAL PROPOSAL,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02F.
W71-10636

NUTRITIONAL ECOLOGY AND COMMUNITY STRUCTURE OF THE PHYTOPLANKTON OF GREEN BAY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05C.
W71-10645

PRELIMINARY EVALUATION OF CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05A.
W71-10736

SELECTIVE WITHDRAWAL FROM A STRATIFIED RESERVOIR,
California Univ., Berkeley.
Jorg Imberger, and Hugo B. Fischer.
For sale by Superintendent of Documents, U.S. GPA-WQO Project 15040 EJZ Government Printing Office, Washington, D.C. 20402 - Price $1.00; from NTIS $0.95 microfiche. PB-201 726. EPA-WQO Report, December 1970. 104 p, 20 fig, 2 tab, 35 ref, append.

Descriptors: *Reservoirs, *Stratified flow, *Withdrawal, *Model studies, *Water quality control, Interfaces, Laboratory tests, Boundary layers, Flow, Viscosity, Hydraulic gradient, Salinity, Velocity, Test procedures, Dye releases, Photography, Tracers, Saline water-freshwater interfaces, Surface waters, Outlets, Density stratification, Thermal stratification, Mathematical models.
Identifiers: *Stratified reservoirs, Multiple outlets, Selective withdrawal.

This study describes both theoretically and experimentally the flow into a line sink in a linearly density stratified reservoir. The geometry of the boundaries is simplified to a parallel walled duct with the line sink at the center of the fluid. The primary focus is on partitioning the flow into distinct flow regimes, and predicting the withdrawal layer thickness as a function of the distance from the sink. Laboratory experiments verified the conclusions reached from the theoretical considerations. The withdrawal layer thicknesses were shown to be closely predicted by the integral solution. Comparison with measurements made by the Tennessee Valley Authority indicates that in a reservoir the

withdrawal layers are approximately one and a half times as large as predicted. The difference in thickness is probably explained by the presence of a certain amount of turbulence in the reservoir, and interference by the rear boundary of the reservoir. (Woodard-USGS)
W71-10750

SEASONAL AND DIURNAL ASPECTS OF ZOOPLANKTON MICRODISTRIBUTION AND VERTICAL MIGRATION,
Tennessee Univ., Knoxville. Dept. of Zoology and Entomology.
Dewey L. Bunting.
Available from the National Technical Information Service as PB-201 728, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June 25, 1971, 9p, 1 fig, 1 tab, 8 ref. OWRR Project A-010-TENN (1).

Descriptors: *Zooplankton, *Vertical migration, *Distribution patterns, Reservoirs, Samplers, Southeast U. S., Dispersion.
Identifiers: *Microdistribution.

Microdistribution and vertical migration patterns of reservoir zooplankton populations were studied seasonally and diurnally using centrifugal pumps designed to take simultaneous samples. The design, use, and performance of the sampler were discussed in detail with suggestions for modification and application to other studies. Diurnal samples were used to describe vertical distribution patterns. In a selected study, most populations showed a least one case of overdispersion. The tendency to clump appeared to be related to total-count variation between each time period, and data were presented to illustrate this relationship. The relationship between variance, population mean, and dispersion were discussed and illustrated. Many species had dispersal patterns which tended towards overdispersion; as the population mean increased, the populations tended to clump. Other species were not as affected by changes in density, and were random. The interactions between some ecological parameters and distribution pattern were discussed. The data suggested that, on a seasonal basis, populations were distributed randomly, with few cases of overdispersion, and fewer of underdispersion. Of 2,102 samples, 92.4% were random, 7.5% were overdispersed, and 0.1% underdispersed.
W71-10756

THE TEMPERATURE CYCLE OF LAKE MICHIGAN. I. SPRING AND SUMMER,
National Weather Service, Kansas City, Mo. Central Region.
Lawrence A. Hughes.
NOAA Technical Memorandum NWS CR-41, April 1971. 18 p, 12 fig, 2 ref.

Descriptors: *Temperature, *Great Lakes, *Lake Michigan, *Hydrography, Water temperature, Forecasting.
Identifiers: *Temperature measurement, Spring season, Summer, Temperature gradients, Temperature distribution.

Knowledge of the temperature cycle of the water of the Great Lakes is essential to forecasting for the lake surface or over-lake conditions, or forecasting conditions over land adjacent to the Lakes. The temperature cycle of Lake Michigan for the spring and summer season is described.
W71-10787

WATER RESOURCES DATA FOR KANSAS, 1970, PART 1. SURFACE-WATER RECORDS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 07C.
W71-10811

LATE QUATERNARY STRATIGRAPHY AND RADIOCARBON CHRONOLOGY OF WATER LEVEL FLUCTUATIONS IN LAKE KEILAMBETE, VICTORIA,
Australian National Univ., Canberra. Dept. of Biogeography and Geomorphology; and Institute of Physical and Chemical Research, Tokyo (Japan).
J. M. Bowler, and Tatsuji Hamada.
Nature, Vol 232, No 5309, p 330-332, July 30, 1971. 3 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Water level fluctuations, *Lakes, *Radioactive dating, Sediments, Core drilling, Analytical techniques.
Identifiers: *Australia, *Lake Keilambete (Australia), Carbon-14.

This is a preliminary report of the stratigraphic and radiocarbon analysis of deposits from Lake Keilambete, located within the western Victorian volcanic province near Kerang, 19 km west-southwest of Melbourne. Radiocarbon dates representing 10 cm vertical thickness were obtained from core samples throughout the upper lake muds, from organic material in the buried soil horizon and from lake marls in the lower lithified unit. The radiocarbon dates form a consistent series. Moreover, the C-14 ages of organic remains in the upper muds are consistent with ages based on estimated rates of deposition. They show no measurable initial error due to incorporation of old carbon into the organic content. The basal lacustrine sediments indicate that lake-full conditions existed from about 30,000 BP until after 18,000 BP. Some time between 15,000 and 18,000 BP the lake dried and remained in this state for several thousand years, long enough to permit soil development on older lake sediments. Ephemeral swampy conditions probably existed at this time. The age of the next water level rise began about 10,000 B. P. (Woodard-USGS)
W71-10819

2I. Water in Plants

A MODELING STUDY OF SEVERAL ASPECTS OF CANOPY FLOW,
Utah Univ., Salt Lake City.
Sumner Barr.
Monthly Weather Review, Vol 99, No 6, p 485-493, June 1971. 9 p, 8 fig, 18 ref.

Descriptors: *Canopy, *Air circulation, Convection, Winds, Microenvironment, Turbulence, Turbulent flow, Mathematical models, Numerical analysis.
Identifiers: *Canopy flow, Waves (Air).

The problem of steady flow in a horizontally infinite vegetation canopy under neutral thermal stratification is treated theoretically. The resulting analytical model is then used as a boundary condition for a nonlinear numerical model designed to study transition regions near the leading and trailing edges of a canopy. This model shows a wave effect downstream from a leading edge observed in the field and laboratory. A tendency for splitting of the flow near a windward canopy edge is also brought out. (Knapp-USGS)
W71-10459

MEASUREMENT OF WATER POTENTIAL OF LEAVES WITH PARTICULAR REFERENCE TO THE SCHARDAKOW METHOD,
Western Australia Univ., Nedlands. Dept. of Botany.
E. O. Hellmuth, and B. J. Grieve.
Flora, Vol 159, No 2, p 147-167, 1969. 4 fig, 5 tab, 23 ref.

Descriptors: *Leaves, *Water balance, *Analytical techniques, *Xerophytes, *Measurements, Osmotic pressure, Physiological ecology, Moisture stress, Gravimetric analysis, Water vapor, Plant physiology, Turbidity, Mesophytes, Humidity.
Identifiers: *Water potential, *Sclerophyllous leaves, *Plant-water relationships, *Australia, *Relative humidity.

Because it does not require the use of sophisticated equipment, the Schardakow method of leaf water potential measurement is especially useful for field studies. Past studies, at least with sclerophylls, have yielded water potential figures even more negative than corresponding osmotic pressure values. A revised form of the Schardakow method has therefore been deviced, utilizing 2 mm diameter leaf disks prepared at approximately 100% relative humidity. A major advantage of this method is the requirement of only a 1-hr equilibration time. Using this method, water potential measurements were made on a variety of young and mature sclerophyllic leaves. Additionally, osmotic potentials were determined by the cryoscopic method and comparative water potential measurements were made by the water vapor gravimetric and strip methods. The revised method led to a mean rise of 36% in water potentials of mature sclerophytic material and a mean rise of 51% in young sclerophytic, semisucculent and mesophytic material, as compared to the original method. Comparison with the gravimetric method indicates the revised method is useful for unlignified leaf material but unsuitable for use with strongly lignified leaves. (Casey-Arizona)
W71-10488

EFFECT OF DECREASED RATE OF WATER ABSORPTION ON WATER BALANCE OF LEAF TISSUE,
Czechoslovak Academy of Sciences, Institute of Experimental Botany, Prague Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky.
For primary bibliographic entry see Field 02D.
W71-10489

PHELLOGEN INITIATION IN THE STEMS OF EUCALYPTUS CAMALDULENSIS DEHNH.,
Tel-Aviv Univ (Israel). Dept. of Botany.
Nili Liphschitz, and Y. Waisel.
Australian Journal of Botany, Vol. 18, No 2, p 185-189, August 1970. 10 fig, 17 ref.

Descriptors: *Plant physiology, *Environmental effects, *Mode of action, Humidity, Oxygen, Temperature, Light.
Identifiers: *Wound healing, *Phellogen.

A number of factors, such as epidermis stripping and tissue wounding, are commonly associated with phellogen initiation, but only scanty data are available concerning environmental effects. Plastic sleeves were installed on green, young, uncorked outside-grown eucalyptus potted saplings. Sleeve treatments involving air temperature, humidity, oxygen and mechanical pressure. Effects were compared with unsleeved control branches. High oxygen and high humidity caused early phellogen initiation, while light, temperature changes and mechanical pressure were ineffective under dry conditions. (Casey-Arizona)
W71-10491

STUDIES IN STOMATAL BEHAVIOR. EFFECTS OF MOVING CARBON DIOXIDE FREE AND STILL AIR ON THE STOMATA OF SOME PLANTS,
U. A. R. Ain Shams Univ., Cairo (Egypt). Dept of Botany.
M. G. A. Hafez, and M. E. Younis.
Beitrage zur Biologie der Pflanzen, Vol 47, No 1, p 1-9, 1970. 3 fig, 1 tab, 11 ref.

Descriptors: *Leaves, *Stomata, *Carbon dioxide, *Humidity, *Air temperature, Plant physiology, Laboratory tests, Mode of action, Evaporation.
Identifiers: *Porometer cups.

Carbon dioxide-free air has been thought to promote leaf stomatal opening. Recent reports,

however, have indicated exceptions to this rule, and it has been postulated that humidity in the region of the stomata may also be implicated in closing and opening. A modified porometer cup capable of delivering dry, carbon dioxide-free air followed by intervals of still air, was applied to the leaves of 4 species, Datura stramonium, Pelargonium zonale, Duranta plumieri and Clerodendron inerme. The stomata of the latter 2 species were known to close under unswept porometer cups. The change from still to dry, carbon dioxide-free air effected stomatal closing in Pelargonium and Datura while an opposite effect was obtained in Clerodendron and Duranta. It therefore seems that neither humidity nor carbon dioxide alone are controlling factors. Possibly these 2 factors interact with temperature changes due to evaporative cooling to influence stomatal movement. (Casey-Arizona)
W71-10492

THE EFFECT OF AIR TEMPERATURE AND MOISTURE STRESS UPON LEAF SURFACE TEMPERATURES OF CALOTROPIS PROCERA (WILLD.) R. BR.,
Volcani Inst. of Agricultural Research, Ilanot (Israel). Forestry Div.
Rene Karschon, and Lydia Pinchas.
Oecologia Plantarum, Vol 6 No 1, p 43-49, 1971. 4 fig, 2 tab, 5 ref.

Descriptors: *Leaves, *Air temperature, *Moisture stress, *Hydration, *Environmental effects, Physiological ecology, Mode of action, Stomata, Meteorology, Transpiration, Shrubs, Xerophytes, Arid lands, Seasonal.

Leaf temperatures may be either warmer or cooler than the surrounding air (under-or overtemperature) and these phenomena may be related to plant hydration levels. Measurements were made on seasonal variations in leaf temperature and on the effect of moisture stress on leaf heating rates. In summer, undertemperatures occured while in November, early morning overtemperatures occured followed by undertemperatures. With wild plants in the Jordan Rift Valley, moisture stress was not apparent and it was felt that changes in transpiration rates, as determined by air temperatures, controlled leaf surface temperatures. In stressed, cultivated plants, overtemperature was directly related to plant hydration. (Casey-Arizona)
W71-10494

OPTICAL PROPERTIES OF LEAVES OF SOME SPECIES IN ARID SOUTH AUSTRALIA,
Adelaide Univ. (Australia). Dept. of Botany.
R. Sinclair, and D. A. Thomas.
Australian Journal of Botany, Vol 8, No 3, p 261-273, 1970. 8 fig, 4 tab, 18 ref.

Descriptors: *Xerophytes, *Leaves, *Absorption, *Energy transfer, *Optical properties, Arid lands, Physiological ecology, Plant morphology, Laboratory tests, Infrared radiation.
Identifiers: *Transmittance, *Reflectance, *Australia.

Leaf energy balance is a crucial factor in plant adaptation. Energy input is determined by the amount of incident solar radiation, the adsorption spectrum of the leaf and its coefficient of absorption. Using an integrating sphere and reflecting hemisphere in combination with a spectrophotometer, reflection and absorption spectra were measured over the wavelength range 350-1350 nm. for the leaves of a number of xerophytic South Australian species and a group of comparison species. With the xerophytic species, there was a wide range of reflection coefficients (23 - 53%) and a slightly narrower range of absorption coefficents (32-56%). Unexpectedly, these values were similar to the corresponding values of the comparison set. The special characteristics of xeromorphic adaptations as well as data from previous investigations imply the existence of lowered incident energy absorption as an important desert plant adaptation, but this study does not support that conclusion. It is stressed that the data must be cautiously interpreted pending direct measurements of absorption. (Casey-Arizona)
W71-10495

ENVIRONMENTAL RESPONSES OF ACTIVE LIZARDS AT SARATOGA SPRINGS, DEATH VALLEY, CALIFORNIA,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
Fenton R. Kay.
Partially supported by National Park Service Contract 14-10-0434-1989. Great Basin Naturalist, Vol 30, No 3, p 146-165, 30 September 1970. 5 fig, 3 tab, 37 ref.

Descriptors: *Reptiles, *Environmental effects, *Niches, *Xerophilic animals, *Heat balance, Arid lands, Physiological ecology, Ecosystems, Animal behavior, Animal physiology, Temperature, Aestivation, Acclimatization, Biological communities, Winds, Rainfall, Mode of action, Air temperature, Cloud cover, On-site investigations, Seasonal.
Identifiers: *Lizards, *Black-bulb temperature, *Substrate temperature, *Body temperature.

The relationships of various environmental components to body temperature and activity were studied in 4 species of lizards, Uta stansburiana, Callisaurus draconoides, Cnemidophorus tigris and Dipsosaurus dorsalis. The environmental components chosen were air temperature, substrate temperature, black-bulb temperature, wind, rain and cloud cover; these were correlated with time of day and season. Although all species reponded primarily to temperature each species responded differently to at least some of the measured environmental components within the thermal mosaic. The most important measures of environmental response were comparisons of mean body temperature (MBT's) relationships between environmental temperatures and activity, and seasonal lability of body temperatures. Body temperature seasonal acclimitization seems likely in Uta and Dipsosaurus, while diel thermal lability is shown in Uta, Callisaurus and Cnemidophorus. Wth differences in intensity of response, all species seemed to respond negatively to rain. Insolation-reducing cloud cover affected the smaller species before the larger, while wind produced a negative response in the larger species first. The complex pattern of different responses has apparently produced maximal environmental utilization with minimal interspecific interaction. (Casey-Arizona)
W71-10496

GRASS SEED PRODUCTION IN NEVADA...NEVADA HAS MANY AREAS WHERE GRASS SEED CAN BE PRODUCED,
Nevada Univ. Reno. Dept of Agronomy; and Nevada Univ., Reno. Agricultural Extension Service.
For primary bibliographic entry see Field 03F.
W71-10500

POTENTIAL PHOTOSYNTHESIS AND CROP PRODUCTIVITY,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 03F.
W71-10502

A QUANTITATIVE MODEL OF THE MOVEMENT OF WATER IN THE PLANT-SOIL-ATMOSPHERE SYSTEM (Kolichestvennaya model' peredvizheniya vody v sisteme rasteniya-pochva-atmosfera),
Moscow State Univ. (USSR). Dept. of Soil Biology.
For primary bibliographic entry see Field 02G.
W71-10600

A COMPARISON OF FIVE WATERSHEDS OF NEW MEXICO AS INTERPRETED FROM THE DISTRIBUTION OF THE SPECIES OF THE AQUATIC BEETLE FAMILY DYTISCIDAE,
New Mexico State Univ., University Park. Dept. of Biology.
James R. Zimmerman.
Available from the National Technical Information Service as PB-201 731, $3.00 in paper copy, $0.95 in microfiche. Completion Report, April, 1971, 14p, 3 fig, 1 tab. OWRR Project A-010-NMEX (1).

Descriptors: Aquatic insects, *Aquatic populations, Aquatic environment, *Distribution patterns, Drainage systems, New Mexico, Pest control, Playas, Ponds, Rivers, River systems, *Water beetles, *Watersheds (Basins), Invertebrates.
Identifiers: *Dytiscidae, Hygrotus, Deronectes, Hydroporus, Laccophilus, Agabus, Rhantus, Thermonectus, Bidessiness, Copelatus.

Species distribution patterns of the aquatic beetle family Dytiscidae were analyzed in the five major watersheds of New Mexico: the San Juan, the Gila, he Rio Grande, the Pecos, and the Canadian drainages. A map is presented showing the drainage divisions as well as the areas with no external drainage. About 8000 specimens from 175 different locality records supplied the material for the comparisons. So far 65 species belonging to 17 genera have been found. The most common genera are Hygrotus, Deronectes, Hydroporus, Laccophilus, Agabus, Rhantus, and Thermonectus. Occurrence and relative abundance is given for each species found. It is estimated from the number of collections made per watershed and the number of species taken per watershed that there may be another 10 to 15 species yet to be found. The bidessines, Copelatus, and the large dytiscines were sparely collected and more refined collecting techniques are necessary to demonstrate their distribution and abundance. Collecting success stimulates additional collecting; relatively more specimens are collected as more collecting effort is made. Species distribution is not related to drainage basin; other topographic and climatic factors are more important.
W71-10754

SOIL MOISTURE AND TEMPERATURE REGIMES ON THE LUBRECHT EXPERIMENTAL FOREST,
Montana Univ., Bozeman. Joint Water Resources Research Center.
Thomas J. Nimlos.
Available from the National Technical Information Service as PB-201 727, $3.00 in paper copy, $0.95 in microfiche. Report 16, March 1971, 45p, 3 fig, 8 tab, 36 ref, 2 append. OWRR Project A-046-MONT (1).

Descriptors: *Moisture stress, *Soil moisture, *Temperature, Montana, Seasonal, Annual succession, Forests, *Forest soils, *Forest management, Soil temperature, Trees, *Fir trees, Douglas fir trees, Plants, Ponderosa pine trees, Lodgepole pine trees, *Pine trees, Grasses.
Identifiers: *Lubrecht Experimental Forest, Western larch, Alder, Aspen, Dogwood, Sedges.

The moisture regimes of the soils on the Lubrecht Experimental Forest range from those which those are wet throughout the year to those in which drought occurs early in the summer. The flora occupying the sites are good indicators of the sites' moisture regimes: open stands of ponderosa pine with understories of grass occur on very dry sites; closed stands of Douglas-fir and western larch with understories of pinegrass, kinnikinick, and twin flower occur on dry sites; lodgepole pine and subalpine fir with understories of huckleberry and beargrass occur on well drained but moist sites; and alder and aspen with understories of dogwood and sedges occur on very wet sites. The well-drained soils of the forest are recharged once annually in the spring when snowmelt and rain combine to wet the mantle. Rains that occur during the summer do

not appear to be of much ecological or hydrologic significance. Soil temperatures reflect air temperatures except that the overstory and snowpack keep soil temperatures lower than air temperatures in the summer and higher than air temperatures in the winter.
W71-10755

THE DEPENDENCE OF PRIMARY PRODUCTION ON THE COMPOSITION OF PHYTOPLANKTON (ZAVISIMOST PERVICHNOI PRODUKTSH OT SOSTAVA FITOPLANKTONA),
Naval Oceanographic Office Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-10788

NEW FRESHWATER GASTROPODS FROM THE MEKONG,
Mahidol Univ, Bangkok (Thailand). Faculty of Tropical Medicine.
Rolf A. M. Brandt.
Available from the National Technical Information Service as AD-720 501, $3.00 in paper copy, $0.95 in microfiche. Archiv fuer Molluskenkunde, band 100, p 183-205, 1970.

Descriptors: *Gastropods, *Mollusks, Parasite.
Identifiers: *Southeast Asia, Disease vectors, Parasitic disease, Schistosoma, Mekong River.

The report of human schistosomiasis from various localities in the Mekong valley initiated a systematic survey of the molluscan fauna at and around these foci in Thailand, Laos and Cambodia. This survey was sponsored by a grant of the U.S. Army Research and Development Command (Grant No. DA-CRD-AFE-S92-544-69-G146). While the Thai staff of this team concentrated mainly on the fauna of the Mekong at Bandan (Thailand) and Khong Island (Laos), the present author studied the molluscan fauna of the Mekong between Sambor and Kratie in North Cambodia. Several French naturalists had previously visited the Mekong at above named localities and had collected numerous species of molluscs during their visits. It was therefore a surprise that the present survey resulted in the finding of still more undescribed species from the Mekong, making this river the richest water course with regard to the molluscan fauna. Some species which were collected by M. Prasong Temcharoen in Thailand and Laos are included, as these species were also found in Cambodia.
W71-10789

POTENTIAL USEFULNESS OF ANTITRANSPIRANTS FOR INCREASING WATER USE EFFICIENCY IN PLANTS, II. APPLIED INVESTIGATIONS WITH ANITRANSPIRANTS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02D.
W71-10804

GROWTH RATE AND PHOSPHORUS UPTAKE OF WHEAT (TRITICUM AESTIVUM VILL., HOST) AS A FUNCTION OF SOIL WATER SUCTION AND SOIL TEMPERATURE,
Oregon State Univ., Corvallis. Dept. of Soils.
Mohammad Fazilat.
M Sc Thesis, June 1971. 93 p, 26 fig, 17 tab, 91 ref. OWRR Project B-009-ORE (2)

Descriptors: *Soil temperature, *Nutrients, *Phosphorus, *Soil-water-plant relationships, Temperature, Moisture content, Moisture stress, Adsorption, Moisture uptake, Translocation, Transpiration, Water requirements, Water utilization, Soil water movement.
Identifiers: Soil water suction.

The effect of soil temperature and soil water suction on the rate of phosphorus uptake and growth rate of wheat was studied. Plants were grown in perlite slabs separated from an osmotic solution by a semi-permeable membrane. Measurements were made at temperatures of 10.0, 18.3, 23.9, 32.2, and 35.0 deg C, and soil water suctions of 0.35 and 2.5 bars. In general, a constant growth rate, which was approached exponentially during the experimental period was found in all treatment combinations. Growth rate for both shoots and roots was slow at low root temperatures and had a maximum rate at a root temperature of 24.0 deg C. High soil water suction was a limiting factor in growth rate. Phosphorus concentration of shoots and roots was found to approach a constant value during the experimental period. Phosphorus concentration of the shoots increased linearly with the root temperature, but the phosphorus concentration of the roots slightly decreased by increasing soil temperature and did not increase until the root temperature was about 32.0 deg C. Translocation of phosphorus from roots to shoots did not appear to be a limiting factor for phosphorus uptake at the low root temperature. (Knapp-USGS)
W71-10912

2J. Erosion and Sedimentation

HYDRAULIC JUMPS IN TURBIDITY CURRENTS,
Saint Andrews Univ. (Scotland). Dept. of Geology.
Paul D. Komar.
Geological Society of America Bulletin, Vol 82, No 6, p 1477-1487, June 1971. 11 p, 7 fig, 16 ref.

Descriptors: *Turbidity currents, *Density currents, *Hydraulic jump, *Suspended load, *Sediment transport, Bed load, Deposition (Sediments), Mathematical studies, Sedimentation, Sedimentary structures, Turbulence, Supercritical flow, Critical flow, Turbulent flow.
Identifiers: *Submarine canyons.

If uniform flow conditions are approached, turbidity currents should be supercritical while passing through submarine canyons, and subcritical in the upper submarine fan channel. The change in flow regime requires a hydraulic jump in the vicinity of the canyon mouth. During the jump, the velocity of the flow would be reduced and its thickness markedly increased. The aspects of such hydraulic jumps are examined. For the average submarine canyon-channel system, the flow would more than double in thickness and its velocity would be halved during a hydraulic jump. The entrainment of water through the interface of the flow during the jump is significant in reducing the density of the current. However, the density reduction due to the jump is probably not sufficient to convert a high-density slide into a low-density turbidity current. There must be an initial density reduction by entrainment while the slide is passing through the canyon at high Froude number. Turbulence generated within the hydraulic jump would stir the flow and help to insure suspension of its sediment. (Knapp-USGS)
W71-10453

OBSERVATIONS ON STREAM DISCHARGE AND COMPETENCE AT MOSAIC CANYON, DEATH VALLEY, CALIFORNIA,
Durham Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W71-10454

QUANTITATIVE METHOD FOR GRADING DRAINAGE DENSITY,
Wilkes Coll., Wilkes-Barre, Pa.
For primary bibliographic entry see Field 04A.
W71-10455

ATOMIC ABSORPTION ANALYSES OF ELEMENTS FROM A SINGLE DECOMPOSITION OF ALUMINOSILICATE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 02K.
W71-10457

STAGES OF PHOSPHORITE FORMATION ON THE OCEAN FLOOR,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
G. N. Baturin.
Nature Physical Science, Vol 232, No 29, p 61-62, July 19, 1971. 2 p, 1 tab, 16 ref.

Descriptors: *Bottom sediments, *Phosphates, Water chemistry, Sedimentation, Diagenesis, Mineralogy, Deposition (Sediments), Currents (Water), Water level fluctuations, Organic matter.
Identifiers: Phosphorite deposits.

The fine grained biogenic sediments (chiefly diatom oozes), in which phosphatic nodules are formed, are enriched by organic carbon up to 5 to 20% and by phosphorous up to 0.1 to 0.4%. The oversaturation of interstitial water by calcium phosphate leads to its precipitation in separate microzones of sediments where the environment is more alkaline. Redistribution in the sediments results in formation of scattered soft nodules consisting originally of gel-like calcium phosphate incorporating various non-phosphatic particles. Further diagenic processes in sediments are accompanied by lithification of nodules. Concentration of this material is possibly due to the reworking of sediments and removal of fine non-phosphatic fractions. The full cycle of marine phosphorite formation comprises three states: biogenic-depositional, diagenetic and dynamic. A number of such cycles repeated in the same region may result in formation of layers of nodules or large lumps composed of several generations of phosphate. (Knapp-USGS)
W71-10468

THE DEPOSITIONAL ENVIRONMENT OF MARINE EVAPORITES: A CASE FOR SHALLOW, CLASTIC ACCUMULATION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
Lawrence A. Hardie, and Hans P. Eugster.
Also supported by Mobile Oil Co. Sedimentology, Vol 16, No 3-4, p 187-220, June 1971. 34 p, 24 fig, 37 ref. Petroleum Research Fund Grant 2093-C.

Descriptors: *Sedimentation, *Gypsum, *Salts, Deposition (Sediments), Lagoons, Evaporation, Algae, Chemical precipitation, Sediments, Stratigraphy, Sedimentary structures.
Identifiers: *Evaporites.

The Upper Miocene Solfifera Series of Sicily contains very coarse, massive selenite; parallel laminated gypsum; wavy, stromatolitic laminated gypsum; planar- and ripple cross-laminated gypsum-skeletal calcite sandstones; flat-pebble and fining-upward gypsum conglomerates; and nodular gypsum. The assemblage of sedimentary features indicates deposition, much of it detrital, in a shallow lagoon-littoral flat complex. In modern tidal flats, the laminations form when onshore storms flood the shore-line area with sediment-charged seawater. Algal mats bind the newly deposited gypsiferous layer. Flat-pebble conglomerates are formed when storm waves rip up mudcracked, algally-bound laminated sediment. The gypsum nodules are similar to the anhydrite nodules of the modern Persian Gulf sabkhas. They form within sub-aerially exposed skeletal sand just above the groundwater table. The gypsum sandstones accumulated periodically in very shallow shoals formed by wind-driven currents. Large selenite crystals grew in increments during deposition, as indicated by flat-topped pockets of gypsum sand between selenite crystals, selenite crystals draped by algal laminations, and

intraformational conglomerates of selenite fragments. (KnappaUSGS)
W71-10476

TEXTURAL DIFFERENTIATION ON THE SHORE FACE DURING EROSIONAL RETREAT OF AN UNCONSOLIDATED COAST, CAPE HENRY TO CAPE HATTERAS, WESTERN NORTH ATLANTIC SHELF,
Old Dominion Univ., Norflok, Va. Inst. of Oceanography.
Donald J. P. Swift, Robert B. Sanford, Charles E. Dill, Jr., and Nicholas F. Avignone.
Also supported by U.S. Geological Survey.
Sedimentology, Vol 16, No 3-4, p 221-250, June 1971. 30 p, 16 fig, 1 tab, 52 ref, append. Coastal Eng. Res. Ctr. Contract DACW-72-69-C-0016.

Descriptors: *Sedimentation, *Coasts, *Beaches, *Erosion, Sands, Sand bars, Provenance, Particle size, Stratigraphy, Littoral drift, Sediment transport, Sampling, Surf, Waves (Water), Continental shelf.
Identifiers: Cape Henry, Cape Hatteras.

In order to evaluate a model of Holocene shelf sediment distribution requiring a near shore modern sand facies and an offshore relict sand facies, a textural reconnaissance was made of the Virginia-North Carolina Coast between Capes Henry and Hatteras. Textural provinces were classified with the aid of factor vector analysis. These include medium-grained sands of the beach and surf zones; seaward fining, fine-grained sands of the shore face, and heterogenous sands of the sea floor. In the sea floor province, grain size is controlled by a ridge and swale topography, with coarser sand on the crests. Coast-wise grain-size trends on the beach and shore face are caused by increase of wave height toward the south, while the Pleistocene sediment sources is exposed higher on the shore face in the north. The shore face is retrograding, except in the vicinity of Diamond Shoals. There is textural evidence for a former Albemarle River channel, which bisects the study area. Barrier superstructures retreat more or less continuously by upper shore-face erosion and storm washover. Lower shore-face erosion results in an equal-volume aggradation of the adjacent sea floor, and forms the leading edge of the Holocene transgressive sand sheet. (Knapp-USGS)
W71-10477

FLUME STUDY OF RIPPLE PROPAGATION BEHIND MOUNDS ON FLAT SAND BEDS,
Massachusetts Inst. of Technology, Cambridge. Dept. of Earth and Planetary Sciences; and Scripps Institution of Oceanography, La Jolla, Calif.
John B. Southard, and John R. Dingler.
Sedimentology, Vol 16, No 3-4, p 251-263, June 1971. 13 p, 9 fig, 1 tab, 11 ref. ONR Contract Nonr 184 (74)-NR-83-157.

Descriptors: *Ripple marks, *Sedimentation, *Scour, *Sediment transport, *Channel morphology, Alluvial channels, Sedimentary structures, Sands, Dunes, Erosion, Regime, Shear stress, Hydraulic models, Model studies, Open channel flow.

Propagation of sediment ripples behind mounds of sediment in uniform flows of water over flat beds of fine sand was studied in a recirculating open channel. If the flow is strong enough, scour downstream of the mound, due to flow separation and impingement of strong eddies on the bed, generates a ripple, which itself grows large enough to cause downstream scour and production of a second ripple; the result is a widening train of ripples. Propagation vs. non-propagation, as a function of mound height and bed shear stress, is interpreted in terms of the hypothesis that ripple development is governed by the relationship between minimum height of bed irregularity necessary to generate ripples and the maximum height of bed irregularity that can be built up by flow over an originally flat bed. Minimum mound height for propagation of ripples was found to be non-zero even when there was some sediment movement on the surrounding flat bed, but there was no sign of spontaneous development of ripples on the flat bed under these conditions; this suggests that there is a range of bed shear stresses for which a flat bed in uniform flow is metastable rather than unstable. (Knapp-USGS)
W71-10478

SOME EROSIONAL FEATURES DUE TO PIPING AND SUB-SURFACE WASH WITH SPECIAL REFERENCE TO THE SUDAN,
University Coll., Dar-es-Salaam (Tanzania). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W71-10485

MORPHOMETRIC ANALYSIS OF PEDIMENTS AND ASSOCIATED LANDFORMS IN THE WESTERN MOJAVE DESERT, CALIFORNIA,
University Coll., London (England). Dept of Geography; and University Coll., London (England). Arid Lands Research Group.
Ronald U. Cooke.
Supported by American Council of Learned Societies, UCLA and University College London.
American Journal of Science, Vol. 269, p 26-38, June 1970. 2 fig, 5 tab, 16 ref.

Descriptors: *Geomorphology, *Terrain analysis, *Arid lands, *Alluvial channels, *Land forming, Erosion, Alluvium, Bedrock, Mountains, Slopes, Deserts, Topography, On-site data collections, Mapping, Measurements, Drainage basins, Faults (Geology), Arizona, California, Correlation analysis.
Identifiers: *Pediments, *Erosion/depositional systems, *Piedmont plains, *Pediment associations, Mojave Desert, Sonoran Desert.

Although pediments have attracted more study than any other southwestern desert landform, such studies have suffered from the faults of disregard of associated geomorphology, lack of quantitative data and concern with possibly unverifiable evolutionary hypotheses. It is asserted that these problems can only be resolved by the use of manipulable quantitative data of pediments and their associations. Such associations in the western Mojave Desert were mapped and morphometric measurements were made. From these data, 13 dimensionless ratios were derived and the values of these ratios were calculated for 53 pediment associations. Using such data, the value of interregional and intraregional comparisons are illustrated by demonstration of similarities and differences of such landforms in the western Mojave Desert and the Sonoran Desert of southern Arizona. Pediment slope appears not to be significantly related to pediment length, catchment basin area or lithology, but is significantly related to pediment association relief/length ratio. It is felt that morphometric data do not provide simple solutions to pediment problems, but are the only easily recoverable part. The data presented are generalized and more detailed data is needed, such as that on drainage nets. Resultingly, such analysis will lead to advances in qualitative problems. (Casey-Arizona)
W71-10493

DISTRIBUTION AND MODE OF OCCURRENCE OF ELEMENTS IN A SURFACE LAYER OF RECENT BLACK SEA SEPOSITS (Raspredeleniye i formy nakhozhdeniya elementov v poverkhnostnom sloye sovremennykh Chernomorskikh otlozheniy),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
N. M. Strakhov, I. V. Belova, M. A. Glagoleva, and I. Yu. Lubchenko.
Litologiya i Poleznyye Iskopayemyye, No 2, p 3-31, March-April 1971. 29 p, 22 fig, 11 tab, 34 ref.

Descriptors: *Geochemistry, *Sediments, *Sedimentation, *Inorganic compounds, *Trace elements, Water chemistry, Hydrodynamics, Sands, Silts, Mud, Mineralogy, Suspension, Sea water, Rivers, Maps, Distribution patterns, Carbon, Particle size, Organic matter.
Identifiers: *USSR, *Black Sea, Danube River, Kuban' River, Nickel, Tungsten, Zirconium, Germanium, Selenium.

The distribution patterns of 21 elements in the surface of recent Black Sea deposits are described. Three groups of elements are distinguished based upon their relationship with the hydrodynamic regime of the lake. Included in the first group are the geochemically least mobile elements --Ti, Zr, Ge, Cr and V. The second group consists of the more mobile elements --Fe, Mn, Ni, Cu, Co, Mo, W, As, Se, U, P, C (organic), Au and, most likely, Sr. The third group includes the elements Pb and Zn, which do not conform to the hydrodynamic system of the waters. Maps showing the concentration of these elements in the Black Sea reveal a clear relationship between their distribution the forms of their migration in the rivers of the basin. (Josefson-USGS)
W71-10591

CONCEPT OF A 'BEACH PLACER' IN CONNECTION WITH ITS ORIGIN (O ponyatii 'pribrezhno-morskaya rossyp" v svyazi s yeye genezisom),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
Yu. D. Shuyskiy.
Litologiya i Poleznyye Iskopayemyye, No 2, p 122-130, March-April 1971. 9 p, 33 ref.

Descriptors: *Placer mining, *Waves (Water), *Sediments, *sediment transport, *Shores, Hydrogeology, Beach erosion, Deposition (Sediments), Geomorphology, Mineralogy, Particle size, Aggradation, Sea water.
Identifiers: *USSR, *Placers, Mechanical concentrations.

An examination is made of several varieties of beach placers, which may be grouped into two categories: stable and mobile. The stable group of placers may be identified as fossil, relict and buried. The mobile group includes numerous moving mechanical concentrations of wave-formed deposits in a shore zone. The wave-formed placer deposit differs basically from the buried, relict, and fossil varieties of beach placers by its mobility (due to wave action), recovery capacity, and independent formation, which is free of the immediate effects of tectonic and eustatic factors. Longshore movement of sediments is a major factor in the formation of beach placers. (Josefson-USGS)
W71-10593

FUNDAMENTAL PROBLEMS IN THE STUDY OF WEATHERING CRUSTS (Osnovnyye problemy izucheniya kor vyvetrivaniya),
Akademiya Nauk SSSR, Moscow. Institut Geologii Rudnykh Mestorozhdenii, Petrografii, Mineralogii i Geokhimi.
D. G. Sapozhnikov, V. Yu. Kondrachuk, B. M. Mikhaylov, and V. P. Petrov.
Litologiya i Poleznyye Iskopayemyye, No 2, p 32-38, March-April, 1971. 7 p.

Descriptors: *Weathering, *Geochemistry, *Erosion, *Geomorphology, *Mineralogy, Sedimentation, Stratigraphy, Geologic time, Sedimentary rocks, Paleohydrology, Crystalline rocks, Laterites, Radioactive dating, Eluvium, Mapping.
Identifiers: *USSR, *Weathering crusts, Zonality, Paleogeography, Supergene ores, Placers.

The present state of investigations of weathering crusts in the Soviet Union and abroad is discussed in the light of promoting research on the mechanical disintegration and chemical

decomposition of rocks. A major task of geologists today is to develop a general theory of crust formation and to examine the formation conditions of supergene mineral deposits. The problems requiring additional research call for (1) examination of the weathering crust as a geological body and as a peculiar geological formation; (2) clarification of the nature of tropic and subtropic weathering crusts; (3) study of the composition and geochemistry of weathered minerals, rocks and residual mineral deposits; (4) study of the geochemistry of weathering crusts; (5) clarification of the genetic and spatial-temporal relationships of weathering crusts to sedimentary rocks and mineral resources; (6) determination of the relative and absolute age of weathered formations: (7) stratigraphic analysis of Precambrian weathering crusts; (8) study of crusts formed on sedimentary rocks; (9) study of the formation of mineral resources associated with weathering crusts; (10) mapping of ancient weathering crusts; and (11) refinement of concepts and definitions for clear understanding and appreciation of the nomenclature and terminology on weathering processes. (Josefson-USGS)
W71-10594

EROSION AND SILTING OF RIVER VALLEYS OF THE DESNA UPLAND (Eroziya i zaileniye rechnykh dolin na Pridesnyanskoy vozvyshennosti),
N. D. Yeshchenko, and I. S. Shpak.
Pochvovedeniye (Soil Science), No 12, p 102-115, December 1970. 14 p, 2 fig, 7 tab, 5 ref.

Descriptors: *Sediment discharge, *Gully erosion, *Silting, *Deposition (Sediments), Alluvium, Ravines, Turbidity, Peat, Particle size, Valleys, Slopes, Streams.
Identifiers: *USSR, Chernigov Oblast, Desna River, Golovesnya River, Alluvial fans, Water erosion.

The upper boundary of buried peat beds in the river valleys of the Desna upland (Chernigov Oblast) coincides with the lower boundary of alluvial deposits formed as a result of accelerated erosion begun 100-200 years ago following the plowing of the steep slopes. The silting of the river valleys is due mainly to gully discharge. The sediment discharge from slopes and ravines where there are no active gullies averages 20-50 kg/ha per year and is more than 500 kg/ha on slopes dissected by numerous gullies. The gullies are responsible for 86-99% of the sediment discharge of the Golovesnya River, for 20-40% of the total sediment discharge in valleys and for 6-9% of the total discharge in small rivers. The long-term average thickness of the layer deposited in alluvial fans is 1-2 cm and in the valleys it is about 0.5 cm/year. (Josefson-USGS)
W71-10596

SEDIMENTATION IN ST. LOUIS BAY, MISSISSIPPI,
Southern Mississippi Univ., Hattiesburg. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W71-10647

A COMPARISON OF TWO METHODS FOR MEASURING RIGIDITY OF SATURATED MARINE SEDIMENTS,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 08D.
W71-10668

WATER CONTENT DETERMINATIONS FOR DRIED MARINE SEDIMENTS,
Naval Postgraduate School Monterey, Calif.
John Christian Peterson.
Available from the National Technical Information Service as AD-722 594, $3.00 in paper copy, $0.95 in microfiche. MS, Thesis, Naval Postgraduate School, March 1971, 64 p.

Descriptors: *Beds, *Sedimentation, *Sea water, *Salinity.
Identifiers: *Ocean bottom sampling.

A quantitative analysis of residual salts in dried marine sediments was accomplished by reconstituting the sediment with distilled water and measuring the salinity of the resulting solution. The information obtained from these measurements provided an excellent basis for predicting the water content of the original unaltered samples. With the original salinity of the interstitial water known the water contents computed from the salt content determinations were, for all practical purposes, as accurate as the original water contents.
W71-10669

WATER POLLUTION FROM EROSION.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05C.
W71-10674

MIE SCATTERING BY SUSPENDED CLAY PARTICLES,
Oregon State Univ., Corvallis. Dept. of Oceanography.
Hasong Pak, J. Ronald V. Zaneveld, and George F. Beardsley, Jr.
Journal of Geophysical Research, Vol 76, No 21, p 5065-5069, Jul 20, 1971. 5 p, 6 fig, 1 tab, 21 ref. ONR Contract N00014-67-A-0369-0007.

Descriptors: *Clays, *Suspension, *Optical properties, Turbidity, Particle size, Light, Light quality, Refractivity, Suspended load, Bottom sediments, Sea water, Pacific Ocean.
Identifiers: Scattering (Light).

The total-scattering coefficient and volume-scattering function of a log-normal distribution of red clay was computed using Mie theory. The total-scattering coefficient was 0.1 (per meter). Ninety percent of the total scattering is due to particles between 0.5 and 8.5 microns in diameter. The volume-scattering function is highly peaked in the forward direction with the half-power points of the forward lobe at 1 1/2 deg. Ninety percent of the forward (1 deg) scattering is produced by larger particles in the range of 1.3 to 18.5 microns in diameter while at larger angles such as 90 deg the bulk of theeffect is caused by particles in the size range of 0.2 to 6.5 microns in diameter. The peak polarization of 0.61 is observed at a scattering angle of 120 deg. The optical properties show little dependence on wavelength. (Knapp-USGS)
W71-10698

PARTICLE SIZE DISTRIBUTIONS IN THE EASTERN EQUATORIAL PACIFIC,
Oregon State Univ., Corvallis. Dept. of Oceanography.
Kendall L. Carder, George F. Beardsley, Jr., and Hasong Pak.
Journal of Geophysical Research, Vol 76, No 21, p 5070-5077, Jul 20, 1971. 8 p, 10 fig, 4 tab, 16 ref.

Descriptors: *Clays, *Suspension, *Optical properties, Turbidity, Particle size, Light, Light quality, Refractivity, Suspended load, Bottom sediments, Sea water, Pacific Ocean.
Identifiers: Scattering (Light).

Size distributions for particles larger than 2.22 microns were measured at selected depths in the eastern equatorial Pacific along with the standard hydrographic variables. The particle size distributions were approximately exponential in shape, but a better fit is provided by the Weibull distribution. Measured particle concentrations at the surface averaged 5,000 cc. Near-surface maxima were found in both number and mean size, especially in regions with sharp thermal gradients. Below the thermocline the concentration decreased rapidly to a typical value of 500 cc. The volume scattering function at 45 deg and the particle size distribution as measured at several stations were combined to create an optical vector consisting of the specific light scattering of the average particle and the cross section of the mean particle. Plots of the optical vector show a characteristic form, with a decrease in mean area accompanying an increase in specific scattering in the water above the oxygen minimum and little change below the minimum. The change in the optical vector with depth appears to be directly related to the oxidation of the decomposable parts of the nepheloid material. (Knapp-USGS)
W71-10699

ACTIVE VALLEY MEANDERS IN SOUTH-CENTRAL TEXAS AND THEIR WIDER IMPLICATIONS,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W71-10706

ORIGIN OF RIDGE-TOP DEPRESSIONS BY LARGE-SCALE CREEP IN THE OLYMPIC MOUNTAINS, WASHINGTON,
Geological Survey, Menlo Park, Calif.
Rowland W. Tabor.
Geological Society of America Bulletin, Vol 82, No 7, p 1811-1822, Jul 1971. 12 p, 12 fig, 28 ref.

Descriptors: *Geomorphology, *Mass wasting, *Creep, *Mountains, *Washington, Gravity, Slopes, Topography, Landslides, Structural geology, Joints (Geology), Fractures (Geology), Stratification.
Identifiers: *Olympic Mountains (Wash).

In the high mountain area of the Olympic Mountains, Washington, there are many troughlike depressions on and essentially parallel to ridge tops. The troughs are mostly developed on rocks with strong planar anisotropy: slate, sandstone, and phyllite. Similar features in Europe, Japan, and New Zealand have been variously ascribed to erosion, slow movement along deep-seated shear planes, creep, and tectonic movements. In the Olympics, many depressions parallel structure; one wall is steeply dipping rocks, the other shattered, gently dipping rocks. These depressions seem to be the gaps left between undisturbed steeply dipping rocks and beds or cleavage bent valleyward by creep. A few troughs may be the result of slow down-slope movement along deep-seated shear planes; this is a favorite explanation of eastern European workers. The Olympic ridge-top depressions testify to the importance of gravity in the degradation of high mountains carved from weak rocks. (Knapp-USGS)
W71-10707

LOWER CONTINENTAL RISE EAST OF THE MIDDLE ATLANTIC STATES: PREDOMINANT SEDIMENT DISPERSAL PERPENDICULAR TO ISODATHS,
Smithsonian Institution, Washington, D.C., Div. of Sedimentology; and Spanish Inst. of Oceanography, Madrid.
Daniel J. Stanley, Harrison Sheng, and Carlos P. Pedraza.
Geological Society of America Bulletin, Vol 82, No 7, p 1831-1839, Jul 1971. 9 p, 5 fig, 32 ref.

Descriptors: *Bottom sediments, *Continental slope, *Turbidity currents, *Sediment transport, *Currents (Water), Sedimentation, Distribution patterns, Bathmetry, Valleys, Topography, Geomorphology.
Identifiers: *Submarine valleys.

The lower continental rise east of the Middle Atlantic United States consists of a series of megafans and well-defined levee-bounded giant valleys meandering across the surfaces of the fans. This region lies below the southwest-flowing Western Boundary Undercurrent, but morphologic features observed are best explained by dominant long-term, gravity-induced, downslope sediment

transport processes. Sediment dispersal by contour currents flowing parallel to isobaths clearly has not been a significant factor in shaping this sector of the lower rise. (Knapp-USGS)
W71-10708

STORM ROLLERS,
Brooklyn Coll., New York. Dept. of Geology.
S. J. Mazzullo.
Geological Society of America Bulletin, Vol 82, No 7, p 1973-1975, Jul 1971. 3 p, 3 fig, 4 ref.

Descriptors: *Sedimentary structures, *Scour, *Clays, *Beaches, *Bottom sediments, Waves (Water), Currents (Water), Deposition (Sediments), Sedimentation, Sediment transport, Storms, New York.
Identifiers: Storm rollers (Sediments).

Scour marks formed by storm rollers were observed on Fire Island, New York. The eventual movement of the storm rollers onto the beach and the resulting formation of scour marks areattributed to storm-generated currents and waves. The comparison of these features to similar ones from sediments of the Middle Devonian Hamilton Formation indicates that two types of scour marks may form from storm rollers, depending upon their site of formation. (Knapp-USGS)
W71-10709

RELATIONS OF CALICHE TO SMALL NATURAL DEPRESSIONS, SOUTHERN HIGH PLAINS, TEXAS AND NEW MEXICO,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
C. C. Reeves, Jr.
Geological Society of America Bulletin, Vol 82, No 7, p 1983-1988, July 1971. 6 p, 7 rig, 10 ref.

Descriptors: *Caliche, *New Mexico, *Texas, *Sands, *Geomorphology, Sedimentation, Erosion, Scour, Sinks, Karst, Topography, Wind erosion, Alluvium, Blowouts, Playas.
Identifiers: High Plains (Tex-N Mex).

Most small natural depressions of the southern High Plains were produced by deflation or depositional irregularities of Pleistocene sand sheets, and thus bear no genetic relation to the underlying Pliocene 'caprock' caliche. Other small depressions have probably been produced by animals. The number of small depressions which reflect sinks in the underlying caliche is unknown. (Knapp-USGS)
W71-10710

CAUSES OF RECENT INCREASED EROSION ALONG UNITED STATES SHORELINES,
Wilkes Coll., Wilkes-Barre, Pa.
M. T. El-Ashry.
Geological Society of America Bulletin, Vol 82, No 7, p 2033-2037, July 1971. 5 p, 4 fig, 1 tab, 9 ref.

Descriptors: *Beaches, *Erosion, *Hurricanes, *Water level fluctuations, Sediment transport, Waves (Water), Storms, Survey, Scour, Littoral drift, Provenance, Topography, Shores, Surf, Tides.
Identifiers: *Shoreline erosion (Eastern US).

The presence of beach ridges extending parallel to the present shorelines of many areas along U.S. coasts indicates progradation of these areas after the last glacial stage of the Pleistocene epoch. The general trend of shoreline changes in the past 100 yrs, however, was erosion of several hundred feet of the beaches. Three major causes are considered responsible for such increased erosion. These are: (1) hurricanes and severe storms; (2) recent eustatic rise in sea level; and (3) interference by man with natural shore processes. (Knapp-USGS)
W71-10711

DEPOSITIONAL MODEL--UPPER CRETACEOUS GALLUP BEACH SHORELINE, SHIP ROCK AREA, NORTHWESTERN NEW MEXICO,
Esso Production Research Co., Houston, Tex.
Charles V. Campbell.
Journal of Sedimentary Petrology, Vol 41, No 2, p 395-409, June 1971. 15 p, 6 fig, 1 tab, 26 ref.

Descriptors: *Sedimentary structures, *Beaches, Paleohydrology, Sedimentation, Sediment transport, Sands, Silt, Mud, Sand bars, Sand waves, Ripple marks, Model studies, Surveys, New Mexico.
Identifiers: Ship Rock (N Mex).

To provide an example of ancient deposits across a sand-beach shoreline for comparison with both recent and other ancient deposits, a cross-sectional model was constructed from surface exposures across the Upper Cretaceous Gallup shoreline in the Ship Rock area of northwestern New Mexico. The model shows lower Gallup regressive-beach sandstone overlain unconformably by upper Gallup transgressive offshore-bar sandstones. Within their stratigraphic frameworks, sedimentary structures, supported by lithologic and paleotologic data, identify both the beach and the offshore-bar sandstones as well as their related facies. Both the beaches and the offshore bars consist of imbricate patterns of parallel beds. Beds of shoreface sandstone are either churned by burrowing organisms or composed of large-scale truncated wave-ripple laminae. In the transition between shoreface and offshore siltstone and mudstone, beds of mudstone interfinger with beds of sandstone and siltstone, which show small-scale truncated wave-ripple laminae and churned structure. Most beds of offshore-bar sandstone are churned, but some show high-angle cross laminae that dip parallel with the length of the bar and approximately parallel with the distant shoreline. Burrowing organisms have completely churned the muddy sandstone beds of the offshore-bar transition. (Knapp-USGS)
W71-10715

MINERALOGY OF SEDIMENTS IN THREE GEORGIA ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga; and Georgia Southern Coll., Statesboro; and Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 02L.
W71-10716

A TEXTURAL STUDY OF MARINE SEDIMENTS IN A PORTION OF CARDIGAN BAY (WALES),
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
Anthony S. G. Jones.
Journal of Sedimentary Petrology, Vol 41, No 2, p 505-516, June 1971. 12 p, 10 fig, 43 ref.

Descriptors: *Bottom sediments, *Particle size, *Sands, *Bays, *Sediment transport, Provenance, Currents (Water), Bathymetry, Glacial drift, Bed load, Tides, Statistics, Statistical methods, Distribution patterns.
Identifiers: *Cardigan Bay (Wales).

Textural analyses of 120 bay samples and 15 beach samples from a portion of southern Cardigan Bay reveal that a large part of the area is floored by well-sorted, medium to fine sands. Coarse gravel sediments are confined to a bathymetric high in the northern part of the area and to a narrow coastal strip. Finer gravels occur on the western boundary. The finest, muddy, sediments are to be found in the region of the Trawling Ground, a bathymetric low. It is concluded that the sign of the skewness is sensitive to the environment. There appears to be a general interrelationship between the form of the bathymetry and the textural parameters. The grain size frequency distributions may best be explained in terms of Spencer's (1963) three fundamental populations and the mixing of two or more of these populations. (Knapp-USGS)
W71-10717

HOLOCENE AND LATE PLEISTOCENE SEDIMENT SOURCES, CONTINENTAL SHELF OFF BRUNSWICK, GEORGIA,
Georgia Univ., Athens. Dept. of Geology.
Robert E. Carver.
Journal of Sedimentary Petrology, Vol 41, No 2, p 517-525, June 1971. 9 p, 5 fig, 3 tab, 17 ref.

Descriptors: *Sediment transport, *Provenance, *Georgia, *Pleistocene epoch, *Littoral drift, Sea level, Water level fluctuations, Beaches, Sand bars, Dunes, Mineralogy, Continental shelf.
Identifiers: Brunswick (Ga).

Analysis of the 2-3 phi heavy-mineral fraction of samples from a transect of the continental shelf off Georgia reveals that hornblende constitutes more than 25% of the non-opaque, non-micaceous heavy-mineral suite in the shelf edge, the central shelf, and the near shore area. Georgia rivers can not be the source of these hornblende-rich sands. The Santee River of South Carolina is a possible source of hornblende-rich sands, and longshore drift is the most probable mechanism of transport to the shelf off Georgia. Holocene beach-dine sands south of the Santee River are composed of hornblende-rich sands from northern sources diluted with more mature sands reworked from the Silver Bluff terrace. Hornblende-rich sands in the central-shelf and shelf-edge areas are composed principally of sands from northern sources, carried in Pleistocene, probably Wisconsin, time. Low-hornblende sands of the inner and outer shelf were derived primarily from local sources during regression or transgression. Sediment sources and transport mechanisms on the Georgia coast vary with sea level oscillation. During regression major sources of sand-sized sediment are the Piedmont and coastal plain of Georgia and the near-shore sea bottom. During transgression sediment from landward sources is trapped in estuaries and becomes bottom sediment. Sediment eroded from headlands and reworked beach-dune and estuarine sediment are the major sources of shore-face sands during transgression. During stillstand the supply of sediment from the adjacent mainland is reduced, longshore-drift rates are high, and hornblende-rich sand from northern sources is the dominant sediment. (Knapp-USGS)
W71-10718

SOME EFFECTS OF ICE ON A RIVER BED,
Keele Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 02C.
W71-10720

DEPRESSIONS IN SHALLOW MARINE SEDIMENT MADE BY BENTHIC FISH,
Raytheon Marine Research Lab., New London, Conn.
David O. Cook.
Journal of Sedimentary Petrology, Vol 41, No 2, p 577-578, June 1971. 2 p, 1 fig, 2 ref. ONR Grant No N00014-67-A-0269-0002.

Descriptors: *Sedimentary structures, *Bottom sediments, *Fish behavior, Ripple marks, Scour, Benthos, Currents (Water).
Identifiers: Biogenic sedimentary structures.

Certain benthic marine fish, including rays, skates, and flatfish, temporarily bury themselves in sediment and thereby create shallow depressions. These have been observed near shore in the Pacific Ocean off southern California, the Gulf of California, and Long Island Sound. If preserved, such biogenic sedimentary structures could aid in interpreting former depositional environments. (Knapp-USGS)
W71-10721

UPSTREAM-DIPPING FORESET CROSS-STRATIFICATION: ORIGIN AND

IMPLICATIONS FOR PALEOSLOPE ANALYSES,
Australian National Univ., Canberra; and Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
G. Taylor, Keith A. W. Crook, and K. D. Woodyer.
Journal of Sedimentary Petrology, Vol 41, No 2, p 578-581, June 1971. 4 p, 3 fig, 16 ref.

Descriptors: *Sedimentary structures, *Stratigraphy, *Bed load, *Alluvial channels, *Flow separation, Sediment transport, Bottom sediments, Turbulent flow, Meanders, Scour, Sedimentation.
Identifiers: *Cross-stratification.

Fluviatile cross-stratification dipping up paleoslope is not always backset cross-stratification. Investigations on the Barwon River, N.S.W., Australia show that upstream-dipping foreset cross-stratification of a type intermediate between Allen's Eta and Theta types can form on point bars due to flow separation at sharp bends, with consequent reverse (upstream) current flow. This cross-stratified sand gave an elongation function curve characteristic of the lower flow regime. (Knapp-USGS)
W71-10722

PEBBLE ORIENTATION IN RELATION TO CROSS-STRATIFICATION: A STATISTICAL STUDY,
Indian Statistical Inst., Calcutta. Research and Training School.
Shibdas Bandyopadhyay.
Journal of Sedimentary Petrology, Vol 41, No 2, p 585-587, June 1971. 3 p, 4 tab, 6 ref. NSF Grant GP-21074.

Descriptors: *Sedimentary structures, *Statistical methods, *Bed load, Channel morphology, Sediment transport, Gravels, Sands, Bottom sediments, Scour, Sedimentation, Meanders, Paleohydrology.
Identifiers: *Cross-stratification.

Elongated pebbles, in general, tend to be arranged transversely to the current direction on the topset and bottomset units having extremely low initial dips. They are arranged longitudinally on the foreset units having greater initial dips. Statistical tests show that long axes of elongated pebbles are parallel to the direction of foreset dip of cross-bedding. On topsets and bottomsets, the directions normal to the long axes of pebbles are parallel to the cross-bedding dip direction when tested at 5 percent level of significance. This confirms that for paleocurrent interpretation, pebble orientation in the central part of foresets is as dependable as the foreset dip direction. (Knapp-USGS)
W71-10723

QUICK PREPARATION OF SLIDES OF WELL-ORIENTED CLAY MINERALS FOR X-RAY DIFFRACTION ANALYSES,
Delaware Univ., Newark. Delaware Geological Survey.
For primary bibliographic entry see Field 07B.
W71-10724

THE 'CATSKILL DELTA': A PROGRADING MUDDY SHORELINE IN CENTRAL PENNSYLVANIA,
McMaster Univ., Hamilton (Ontario). Dept. of Geology; and Marathon Oil Co., Littleton, Colo., Denver Research Center.
Roger G. Walker, and J. C. Harms.
Journal of Geology, Vol 79, No 4, p 381-399, July 1971. 19 p, 13 fig, 1 plate, 30 ref, 2 append.

Descriptors: *Sedimentation, *Deltas, *Stratigraphy, *Paleohydrology, Sands, Turbidity currents, Beaches, Bottom sediments, Mud, Sandstones, Sediment transport.
Identifiers: Catskill formation.

The Upper Devonian Catskill Formation contains at its base the Irish Valley Member, which is about 600 m thick, and consists of alternating marine and nonmarine strata. Below the Irish Valley is a sequence of turbidites and slope deposits, and above, a sequence of dominantly nonmarine alluvial plain sediments. The Irish Valley Member contains about twenty-five repeated facies sequences, varying in thickness from about 4 to 45 m. From bottom to top, the sequences contain: (1) a sharp basal surface; (2) green bioturbate fine sandstone, with scattered quartz granules and brachiopods or crinoidal debris; (3) olive green fissile shale; (4) green siltstones with thin wave-rippled sandstones and sparse marine fauna; (5) red siltstones with root traces, desiccation cracks, and very thin wave-rippled sandstones; and (6) red siltstones with root traces, desiccation cracks, tan calcareous nodules and, in some cases, fining-upward alluvial sequences. We suggest phases 1 and 2 indicate marine transgression, phases 3 and 4 indicate shoaling by progradation of a muddy shoreline (sand bodies thicker than 50 cm are rare), phases 5 and 6 represent mainly vertical accretion on a coastal plain. The absence of major sand bodies in phase 4 shows that wave action was slight, the tidal range was low, and the rate of mud supply by longshore drift was high. Shifting in position of the major streams during regional subsidence is the probable cause of repetition of the sequences. (Knapp-USGS)
W71-10726

A CAMBRIAN TIDAL SAND BODY--THE ERIBOLL SANDSTONE OF NORTHWEST SCOTLAND: AN ANCIENT-RECENT ANALOG,
Iowa Univ., Iowa City. Dept. of Geology; and Illinois Univ., Urbana, Dept. of Geology.
Keene Swett, George Devries Klein, and Davis E. Smit.
Journal of Geology, Vol 79, No 4, p 400-415, July 1971. 16 p, 8 fig, 64 ref. NSF Grants GA-1107 and GA-11077.

Descriptors: *Sands, *Sedimentation, *Tides, *Sedimentary structures, *Stratigraphy, Sediment transport, Paleohydrology, Bottom sediments, Tidal effects.
Identifiers: Tidal sand-deposits.

The origin of many mineralogically mature, marine sandstones can be related to paleotidal processes. The Cambrian Eriboll Sandstone of northwest Scotland is divisible into a prominently cross-stratified Lower Member and an Upper Pike Rock Member. The Lower Member consists of medium-grained, well-sorted, mature quartzarenite and subarkose. Sedimentary structures in this member include planar, herringbone cross-stratification, reactivation surfaces, interference ripples, and both current ripples and micro-cross-laminae superimposed at 90 deg on slip faces of cross-strata. The frequency distribution of set thicknesses are multimodal, whereas distributions of dip angles of cross-strata are bimodal. Cross-strata azimuth orientations are bimodal and multimodal. The Pike Rock Member is massive-bedded with burrows of Scolithus and Monocraterion. Reactivation surfaces and bimodal distributions of both cross-strata set thickness and dip angles suggest a paleotidal flow mechanism characterized by time-velocity asymmetry. Escape structures of burrows combined with overlying intertidal and supratidal carbonate rocks also indicate a tidal depositional environment for the Eriboll Sandstone. The tidal sand body environment is characterized by intensive reworking, and by equilibrium sand transport patterns through alternate flood-dominated and ebb-dominated zones. Mineralogical and textural maturity is achieved by sediment transport over long distances combined with weathering at intermediate depositional sites. (Knapp-USGS)
W71-10727

SYSTEMATIC BEACH CHANGES ON THE OUTER BANKS, NORTH CAROLINA,
Louisiana State Univ., Baton Rouge, Coastal Studies Inst.
Choule J. Sonu, and Johannes L. Van Beek.
Journal of Geology, Vol 79, No 4, p 416-425, July 1971. 10 p, 10 fig, 10 ref.

Descriptors: *Beaches, *Sedimentation, *Erosion, *North Carolina, Profiles, Sands, Sediment transport, Littoral drift, Waves (Water), Surf, Model studies, Surveys, Mapping.
Identifiers: Outer Banks (NC).

A beach-profile transition model is derived from analysis of 291 semidiurnal beach profiles measured on the Outer Banks, North Carolina. The model allows prediction of successive beach profiles in terms of beach width, sediment storage, and surface configuration. The prediction requires knowledge of the initial profile and the stage in the development of a wave field. The model explains beach cycles which are purely associated with wave activity. (Knapp-USGS)
W71-10728

COMPARISON OF STRATIGRAPHIC AND ELECTRON MICROSCOPIC STUDIES IN VIRGINIA PLEISTOCENE COASTAL SEDIMENTS,
Queens Coll., New York. Dept. of Earth and Environmental Sciences.
Nicholas K. Coch, and David H. Krinsley.
Journal of Geology, Vol 79, No 4, p 426-437, July 1971. 12 p, 12 fig, 2 tab, 11 ref.

Descriptors: *Stratigraphy, *Coastal plains, *Virginia, *Sands, *Quartz, Provenance, Sedimentary structures, Sediment transport, Electron microscopy, Sampling, Mapping, Sedimentation, Sea level, Beaches, Pleistocene epoch.
Identifiers: Sedimentary environments.

Quartz grains from Pleistocene nearshore marine beach-dune and lagoonal-estuarine stratigraphic units in southeastern Virginia were studied with the transmission and scanning microscopes to determine if results of electron-microscopic studies correlate with independent field data. Relative ages of stratigraphic units were determined from the degree of etching and obliteration of mechanical features on quartz-grain surfaces. Superposed surface features indicated depositional histories and were used to determine maximum relative sea level along each shoreline. Shorelines with southward longshore drift were distinguished from those with northward longshore drift by the presence or absence of glacial surface features on quartz grains. (Knapp-USGS)
W71-10729

THE RIVER PROFILE,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W71-10730

EFFECT OF LARGE RANGE SEDIMENT MIXTURES AND SELF-PAVEMENT OF BEDS ON THE MOVEMENT AND DISCHARGE OF SEDIMENTS (VLIYANIE SHIROKOI SEMESI NANOSOV I SAMOOTMOSTKI RUSLA NA DVIZHENIE RASKHOD NANOSOV),
I. V. Egyazarov.
Available from the National Technical Information Service as TT-705 7226, $3.00 in paper copy, $0.95 in microfiche. Indian National Scientific Documentation Center translation, 1970. Trans. from Izvestiya Akademii Nauk Annyanskoi SSR, Seriya Tekhnicheskikh Nauk, Vol 17, No 2, p 29-44, 1964.

Descriptors: *Sediment transport, *Channel improvement, Flow, *Reynolds number, Discharge.
Identifiers: *Channel stabilization, Stream flow, Particle size, USSR.

Investigations had almost exclusively been confined to homogeneous sediments under laboratory conditions without any reference to the

calculations of their mobility and discharge under natural conditions. The effect of heterogeneous sediment mixtures was considered most simply by introducing some fairly discrete and inadequately verified mean particle size. Pantelopulos, Czechoslovakia was one of the first to study theoretically the effect of granulometric curves on the movement of mixtures and to verify it in the laboratory. The object of the study was to work out an improved method of calculation having a better theoretical basis, less tedious to work with, and based on the relationships obtained earlier for homogeneous sediments.
W71-10775

SHORELINE CHANGES HUMBOLDT BAY, CALIFORNIA,
California Univ., Berkeley. Hydraulic Engineering Lab.
Ronald M. Noble.
Available from the National Technical Information Service as AD-721 297, $3.00 in paper copy, $0.95 in microfiche. Technical rept., Rept. no HEL-24-2, Feb 71. 40 p. Contract DACW72-71-C-0005.

Descriptors: *Littoral drift, *Breakwaters, *Jetties, *Ocean waves, Shore protection, Eroion control, Sedimentation, Tides, Construction materials, Riprap, Ocean currents, Coastal structures.
Identifiers: Ocean bottom topography, California, Humboldt Bay, Coastal topographic features, Coastal engineering.

The movement of littoral drift is a major concern in the design of coastal installations. This report discusses the shoreline changes in the vicinity of the Humboldt entrance from the time that it was an unimproved tidal inlet through the years of modifications to the entrance.
W71-10778

SEDIMENT TRANSPORT BY STREAMS IN THE PALOUSE RIVER BASIN, WASHINGTON AND IDAHO, JULY 1961-JUNE 1965,
Geological Survey, Washington, D.C.
P. R. Boucher.
For sale by the Superintendent of Documents U.S. Government Printing Office, Washington, D.C. 20402 -Price 70 cents. Geological Survey Water Supply Paper 1899-C, 1970. 37 p, 7 fig, 1 plate, 10 tab, 27 ref.

Descriptors: *Sediment transport, *Streamflow, *Sediments, *Idaho, *Washington, Erosion, Rainfall-runoff relationships, Land use, Urbanization, Construction, Sediment load, Particle size, Sediment yield, Rivers, Geology, Hydrology.
Identifiers: *Palouse River Basin.

The Palouse River basin covers about 3,300 square miles in southeastern Washington and northwestern Idaho. Surface runoff from the basin for the 4-year period of study (July 1961-June 1965) averaged 408,000 acre-feet per year, compared with 445,200 acre-feet per year for the 27-year period of record. The eastern part of the basin contributed about 55% of the total, whereas the central and western parts contributed 37% and 8%, respectively. The average annual sediment discharge of the Palouse River at its mouth was about 1,580,000 tons per year, and the estimated average annual sediment yield was 480 tons per square mile. During high flow, silt particles make up the largest part of the suspended-sediment load, whereas during low flow, clay particles represent the greatest part. On the average, the suspended sediment transported by the Palouse River past Hooper contained 3% sand, 68% silt, and 29% clay. Unmeasured sediment discharge was estimated to have been 5% of the total sediment discharge. The greatest effect on the increase of sediment yields is land use. (Woodard-USGS)
W71-10824

SUBSURFACE CHEMICAL EROSION IN THE USSR (O Podzemnoy khimicheskoy denudatsii na territorii SSSR),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
F. A. Makarenko, and V. P. Zverev.
Akademiya Nauk SSSR Doklady, Vol 192, No 2, p 424-427, 1970. 1 fig, 1 tab, 11 ref.

Descriptors: *Erosion, *Sedimentation, *Sediment transport, *Subsurface runoff, *Surface runoff, Subsurface flow, Vadose water, Groundwater movement, Salts, Salinity, Weathering, Sedimentary rocks, Aquifers, Geologic formations, Distribution patterns, Permafrost, Geochemistry.
Identifiers: *USSR, Greater Caucasus, Chemical erosion, Mechanical erosion, Tectonics.

Chemical erosion, which is expressed by the removal of chemical sediments from continents, is effected by two genetically different processes: surface chemical weathering, which is the result of the transport of chemicals by surface and vadose waters forming the actual surface chemical runoff; and subsurface chemical discharge, which leads to mass transport and redistribution of material directly within the crust. In the USSR these two processes contribute to a redistribution of 161 million and 279.6 million metric tons of solutes a year, respectively. Subsurface discharge is the principal agent in the chemical erosion and mobilization of continental material. Its intensity, which reflects the amount of dissolved salts removed by groundwater from the crust per unit time, depends upon the total mass of flowing groundwater and on its salinity. Subsurface chemical discharge for the USSR ranges from 0.05 cm per 1,000 years in extreme northeastern regions where there is a thick permafrost layer to 4.0 cm per 1,000 years in alpine regions of the Greater Caucasus, and averages 0.5 cm per 1,000 years. Subsurface chemical erosion, as a powerful erosion agent in many large areas of the USSR, must be taken into account in geologic investigations of a regional and global character. (Josefson-USGS)
W71-10828

THE EFFECT OF VARYING THE PARAMETERS OF VANE SHEAR TESTS OF MARINE SEDIMENTS,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 08D.
W71-10899

DIRECT SHEAR TESTING OF MARINE SEDIMENT,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 08D.
W71-10900

2K. Chemical Processes

CHARACTERIZATION OF THE PRINCIPAL WEATHERING TYPES BY THE GEOCHEMISTRY OF WATERS FROM SOME EUROPEAN AND AFRICAN CRYSTALLINE MASSIFS,
Centre National de la Recherche Scientifique, Strasbourg (France). Centre de Sedimentologie at Geochimie de Surface.
Y. Tardy.
Chemical Geology, Vol 7, No 4, p 253-271, June 1971. 19 p, 6 fig, 3 tab, 44 ref.

Descriptors: *Weathering, *Water chemistry, Geochemistry, Silicates, Leaching, Sampling, Igneous rocks, Metamorphic rocks, Clay minerals, Kaolinite, Silica, Sodium, Calcium, Potassium, Magnesium, Thermodynamics, Equilibrium.
Identifiers: Crystalline rocks, Gibbsite.

Samples of water were collected from several crystalline massifs in Norway, France, Sahara, Senegal, Chad, Ivory Coast and Malagasy. The chemical composition of the waters was studied in relation with the dynamics of weathering. The data of thermodynamics show the gibbsite, kaolinite and montmorillinite domains of stability; thus which of these weathering minerals is in equilibrium with the waters draining the landscapes can be determined. The ratio of the removal of basic cations to that of silica in waters show the principal geochemical process of present-day weathering in a region: allitization, monosiallitization, or bisiallitization. The molecular ratios SiO2/ (Na2O..K2O..CaO.. MgO) and (6Na2O..6K2O..2CaO-SiO2)/ (Na2O..K2O..CaO) in the solutions characterize these principal types of evolution. The results of thermodynamic and geochemical balances are in good agreement with the data of the evolution of weathering. (Knapp-USGS)
W71-10456

ATOMIC ABSORPTION ANALYSES OF ELEMENTS FROM A SINGLE DECOMPOSITION OF ALUMINOSILICATE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
D. E. Buckley, and R. E. Cranston.
Chemical Geology, Vol 7, No 4, p 273-284, June 1971. 12 p, 1 fig, 5 tab, 11 ref.

Descriptors: *Silicates, *Chemical analysis, *Flame photometry, Analytical techniques, Photometry, Geochemistry, Sediments, Mineralogy.
Identifiers: Atomic absorption photometry.

The atomic absorption determination of 18 elements in aluminosilicate minerals and marine sediments is accomplished after a single decomposition method using hydrofluoric acid and aqua regia. The digested sample is combined with boric acid to give a 100 ml solution from which all 18 elements including Si, Ti, V, and Al can be determined directly by means of atomic absorption spectroscopy. Inter-element interfaces and ionization effects are fully compensated by using combined standards having a matrix similar to that of the samples. Precision and accuracy for most determinations are comparable to the other more complex analytical techniques while the speed of analyses is considerably faster than existing methods. (Knapp-USGS)
W71-10457

pH-DILUTION CURVES OF SALINE WATERS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
O. Amit, and Y. K. Bentor.
Chemical Geology, Vol 7, No 4, p 307-313, June 1971. 7 p, 1 fig, 5 tab, 2 ref.

Descriptors: *Water chemistry, *Saline water, *Brines, *Hydrogen ion concentration, Gypsum, Sulfates, Bicarbonates, Carbonates, Sulfides, Carbon dioxide, Ions, Equilibrium.
Identifiers: Dead Sea, Red Sea, Mediterranean.

The pH of various saline solutions--waters from the Dead Sea, Red Sea, the Mediterranean and salt springs from the Tiberias area--and of their artificial equivalents was found to increase on dilution with distilled water. The effect is confined to waters containing more than 1.2-1.5% dissolved solids, and is roughly proportional to the original salinity of the solution. The effect is not found in solutions devoid of HCO3 salts. It is concluded that in strong brines, dissociation of bicarbonate salts is depressed; on dilution dissociation increases, hydroxide ions are formed and the pH increases. It follows that in evaporate sediments carbonate minerals might be stable at pH-values as low as 5.5. (Knapp-USGS)
W71-10458

STAGES OF PHOSPHORITE FORMATION ON THE OCEAN FLOOR,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W71-10468

SOME ASPECTS OF THE PHENOL-HYPOCHLORITE REACTION AS APPLIED TO AMMONIA ANALYSIS,
National Inst. for Water Research, Pretoria (South Africa).
J. E. Harwood, and D. J. Huyser.
Water Research, Vol 4, No 7, p 501-515, July 1970. 15 p, 10 fig, 1 tab, 37 ref.

Descriptors: *Chemical analysis, *Water chemistry, *Ammonia, *Phenols, *Chemical reactions, Analytical techniques, Color, Catalysts, Hydrolysis, Reviews.
Identifiers: Phenol-hypochlorite.

The effects were studied of changes in phenol, hypochlorite and catalyst concentrations on the indophenol blue reaction to determine ammonia-nitrogen, using acetone and sodium nitroprusside as catalysts. The effect of pH on the color intensity, stability, and rate of development was also investigated using the Autoanalyzer. Nitroprusside was generally found to be far superior to acetone, providing a stable color and rapid color development. Increasing the pH increased both the final color obtained and the rate of development. With excess caustic present, the color became unstable and sensitivity decreased. (Woodard-USGS)
W71-10579

DISTRIBUTION AND MODE OF OCCURRENCE OF ELEMENTS IN A SURFACE LAYER OF RECENT BLACK SEA SEPOSITS (Raspredeleniye i formy nakhozhdeniya elementov v poverkhnostnom sloye sovremennykh Chernomorskikh otlozheniy),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 02J.
W71-10591

GEOCHEMICAL STUDIES ON CONTINENTAL WATERS. ANNUAL REPORT AND RENEWAL PROPOSAL,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02F.
W71-10636

HOW TO MEASURE THE ISOTHERMAL COMPRESSIBILITY OF LIQUIDS ACCURATELY,
National Engineering Lab., East Kilbridge (Scotland).
For primary bibliographic entry see Field 01A.
W71-10689

AUTOMATED AND MONITORING TECHNIQUES,
For primary bibliographic entry see Field 05A.
W71-10693

THE DEEP METABOLISM: OXYGEN CONSUMPTION IN ABYSSAL OCEAN WATER,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W71-10700

THE RUBIDIUM, STRONTIUM, STRONTIUM-ISOTOPE SYSTEM IN DEEP-SEA SEDIMENTS: ARGENTINE BASIN,
Lamont-Doherty Geological Observatory, Palisades, N.Y., and Yale Univ., New Haven, Conn.
Pierre E. Biscaye, and E. Julius Dasch.
Journal of Geophysical Research, Vol 76, No 21, p 5087-5096, Jul 20, 1971. 10 p, 3 fig, 2 tab, 20 ref.
AEC Contract AT (30-1)4055.

Descriptors: *Bottom sediments, *Atlantic Ocean, *Radioactive dating, Continental shelf, Estuaries, Strontium radioisotopes, Silicates, Sampling, Provenance, Weathering, Geochemistry, Water chemistry, Clay minerals.
Identifiers: *Rubidium-Strontium dating, *Argentine basin.

Silicate fractions of deep-sea, continental shelf, and estuary sediments from uppermost layers of the Argentine basin and contiguous regions were analyzed for rubidium and strontium concentrations and for strontium-isotope composition. These data give areal indications of sediment provenance but may be equivocal owing to elemental and isotopic variability caused by hydrodynamic processes such as winnowing and differential sedimentation. Plotted on an isochron diagram, however, the data form an envelope of points with characteristic slope. Samples from the area in which mixing of Plata and Argentine basin material may occur fall between these fields. The slope and approximate initial ratio (Sr-87/Sr-86 at Rb/Sr—0) of the arrays can be used to calculate an apparent age for these modern sediments. The apparent age is a complex integrated function of the geologic ages, rock types, and weathering processes operative in the source areas of the sediments. Within the analytical and sampling errors the apparent age of sediments south of the Plata estuary are indistinguishable as to southern Argentina or Antarctic Ocean provenance. (Knapp-USGS)
W71-10701

LEAD ISOTOPES IN MARINE MANGANESE NODULES AND THE ORE-LEAD GROWTH CURVE,
Australian National Univ., Canberra. Dept. of Geophysics and Geochemistry.
Peter H. Reynolds, and E. Julius Dasch.
Journal of Geophysical Research, Vol 76, No 21, p 5124-5129, Jul 20, 1971. 6 p, 3 fig, 1 tab, 16 ref.

Descriptors: *Bottom sediments, *Manganese, *Lead radioisotopes, *Stable isotopes, Radioactive dating, Water chemistry, Geochemistry, Chemical analysis, Radiochemical analysis.
Identifiers: *Manganese nodules.

A study of lead-isotope compositions in marine manganese nodules was made, using the double-spike method in conjunction with an absolute isotope standard. Observed Pb-206/Pb-204 and Pb-208/Pb-204 ratios are higher, or more radiogenic, than the corresponding zero model-age ore-lead abundances (end points of the primary ore-lead growth curves). Many of the leads, however, are probably present-day products of the ore-lead system. Total Pb-207/Pb-204 variation is much less than that found by Chow and Patterson in 1962. The small variations probably are caused in part by a simple mixing of lead derived from crustal and mantle sources. (Knapp-USGS)
W71-10704

BIOCHEMISTRY OF SEDIMENT SAMPLES FROM BROADKILL MARSH, DELAWARE,
Delaware Univ., Newark, Dept. of Geology; and Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02L.
W71-10719

DETERMINATION OF MINOR ELEMENTS IN WATER BY EMISSION SPECTROSCOPY,
Geological Survey, Washington, D.C.
Paul R. Barnett, and E. C. Mallory, Jr.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402--Price 50 cents. Geological Survey Techniques of Water Resources Investigations, Book 5, Chapter A2, 1971. 31 p, 6 fig, 15 tab, 7 ref.

Descriptors: *Water chemistry, *Chemical analysis, *Trace elements, *Analytical techniques, *Spectroscopy, Water analysis, Instrumentation, Methodology, Laboratory tests, Data processing, Computer programs, Pollutant identification.
Identifiers: Minor elements, Emission spectroscopy, Computer programs (Fortran).

With the emission spectrograph, the analyst is able to determine many minor elements simultaneously in water samples. Spectrograph methods differ chiefly in techniques of preconcentrating the elements. For waters with dissolved solids of less than 1,000 milligrams per liter, the method of evaporating to dryness and determining the elements in the dried residue is sensitive, precise, and reasonably accurate. The lower limits of detection vary with the quantity of dissolved solids. Twenty-four elements are determined by this method. For waters with more than 1,000 mg/liter of dissolved solids, it is necessary to separate the minor elements from the major constituents in order to achieve adequate lower limits of detection. Such procedures generally require more time than the residue method. In the first of two such procedures given, 21 of the metallic elements are precipitated with thioacetamide prior to spectrographic determination. In an alternate procedure, 18 elements are precipitated quantitatively with complexing reagents 8-hydroxyquinoline, tannic acid, and thioanlide. This method is faster than the thioacetamide method, but at the sacrifice of some elements. A Fortran IV computer program for processing densitometric data is given. (Woodard-USGS)
W71-10807

SOME INVESTIGATIONS OF THE DEPOSITION OF TRAVERTINE FROM HOT SPRINGS - 1. THE ISOTOPIC CHEMISTRY OF A TRAVERTINE-DEPOSITING SPRING,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-10814

CONVERSION OF OLEIC ACID TO SATURATED FATTY ACIDS IN SEVERN ESTUARY SEDIMENTS,
Bristol Univ. (England). Organic Geochemistry Unit; and Bristol Univ (England). Dept. of Biochemistry.
For primary bibliographic entry see Field 02L.
W71-10818

ROLE OF CHEMICAL PRECIPITATION IN FORMING THE COMPOSITION OF STREAMFLOW (K voprosu o roli khimicheskogo sostava atmosfernykh osadkov v formirovanii sostava rechnykh vod).
Gidrometeorologicheskii Institut, Leningrad (USSR).

In: Meteorologiya, Gidrologiya Vod Sushi i Okeanologiya, Leningradskiy Gidrometeorologicheskiy Institut Trudy, No 39; p 140-148, 1970. 1 tab, 22 ref.

Descriptors: *Chemical precipitation, *Chemistry of precipitation, *Streamflow, Precipitation (Atmospheric), Aerosols, Atmosphere, Runoff, Sulfates, Sulfur, Evaporation, Wind erosion, Ions, Calcium, Magnesium, Salts, Atmospheric physics, Sea water.
Identifiers: *USSR, European USSR, Mineralization.

The composition of salts (ions) in atmospheric precipitation and streamflow of the European USSR is examined in conjunction with the role of various factors in the formation of aerosols in the atmosphere. The average amount of mineral salts introduced into streamflow of the area by atmospheric precipitation is 32% of the total solutes in streamflow. This proportion varies in individual basins. The amount of atmospheric salts in streamflow is equal to the salt in the precipitation minus the amount of salt in the water evaporated during runoff. Sulfates removed by wind from soils, saline lakes and ice surfaces are the basic source of sulfate ions, which are the predominant ions in the precipitation. HCO (3), Ca and Mg ions are related primarily to sources of continental origin. Salts removed from an ocean surface dominate the composition of precipitation

near the ocean but are of secondary importance in the composition of precipitation over dry land areas. (Josefson-USGS)
W71-10827

SUBSURFACE CHEMICAL EROSION IN THE USSR (O Podzemnoy khimicheskoy denudatsii na territorii SSSR),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 02J.
W71-10828

SALT ACCUMULATION IN SOILS AND GROUNDWATER OF IRRIGATED AREAS OF RIVER VALLEYS IN TADZHIKISTAN (Protsessy solenakopleniya v pochvenno-gruntovykh vodakh na oroshayemykh zemlyakh rechnykh dolin Tadzhikistana),
Tadzhik Scientific Research Inst. of Soil Science, Dushambe.
For primary bibliographic entry see Field 02G.
W71-10832

THE TRACE FLUOROMETRIC DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN NATURAL WATER,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-10914

2L. Estuaries

MAGNITUDE OF INTERFACIAL SHEAR IN EXCHANGE FLOW,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 08B.
W71-10469

SEDIMENTATION IN ST. LOUIS BAY, MISSISSIPPI,
Southern Mississippi Univ., Hattiesburg. Dept. of Geology.
Charles M. Hoskin.
Available from the National Technical Information Service as PB-201 697, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June, 1971, 22 p, 5 fig, 4 tab, 17 ref. OWRR Project A-042-MISS (1).

Descriptors: *Sedimentation, Marine geology, Estuaries, Mississippi, Sediment transport, Silicates, Sediments, *Sands, *Silts, *Clays, Deposition (Sediments), Salinity, Mud.
Identifiers: *St. Louis (Miss), Detrital silicates, Mud flocculation.

Sediments now accumulating in St. Louis Bay are detrital silicates with trace amounts of particulate organic matter and shell fragments. Twenty seven percent of the Bay surface sediments are sands, the remainder being sandy silt-clay mixtures. Average grainsize composition, by weight, for 62 Bay sediments is a trace of gravel, 34 percent sand, 30 percent silt and 36 percent clay. Sand is supplied by westward longshore drift from the man-made north shore beach of Mississippi Sound. There may be two sources of sand as evidenced by the common occurrence of angular and well-rounded quartz grains in the same size class. Sand accumulates near the Bay mouth, in places only inches thick, overlying the continental Citronelle Formation. Sand modes are coarsest at the Bay mouth (0.28mm, 1.6 phi) and become finer to the northwest Bay (0.09mm, 3.5 phi), suggestive of selective size transport from the south. Silt and clay are supplied by the Wolf and Jourdan Rivers and on the flood tide from Mississippi Sound. Salinity of the Bay water, 7 to 8 percent, is sufficient to cause mud flocculation. Silt size modes are coarsest in the northwest Bay (22.5 microns, 5.50 phi) and become finer southward toward the Bay mouth (11.2 microns, 6.5 phi). Mud is now accumulating near the river mouths and in the northwest Bay as interpreted from high water content of mud (74 percent) in those places in contrast to lower water content of surface mud at the Bay mouth (53 percent).
W71-10647

THE RUBIDIUM, STRONTIUM, STRONTIUM-ISOTOPE SYSTEM IN DEEP-SEA SEDIMENTS: ARGENTINE BASIN,
Lamont-Doherty Geological Observatory, Palisades, N.Y., and Yale Univ., New Haven, Conn.
For primary bibliographic entry see Field 02K.
W71-10701

MINERALOGY OF SEDIMENTS IN THREE GEORGIA ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga; and Georgia Southern Coll., Statesboro; and Georgia Inst. of Tech., Atlanta.
Herbert L. Windom, William J. Neal, and Kevin C. Beck.
Journal of Sedimentary Petrology, Vol 41, No 2, p 497-504, June 1971. 8 p, 4 fig, 4 tab, 12 ref.

Descriptors: *Mineralogy, *Bottom sediments, *Estuaries, *Georgia, Sedimentation, Provenance, Sediment transport, Currents (Water), Sands, Silts, Clays, Illite, Montmorillonite, Flocculation.
Identifiers: Altamaha Estuary (Ga), Ogeechee Estuary (Ga), Satilla Estuary (Ga).

Mineralological analyses of suspended sediments and bottom sediments from three Georgia estuaries (Altamaha, Ogeechee, and Satilla Rivers) indicate that the clastics of this area are a mixture of fluvially derived Piedmont and Coastal Plain detritus, and fine material derived from the continental shelf. High illite-montmorillonite clay suites are transported into the estuaries from offshore during flood tide, whereas kaolinite plus minor mixed-layer clay, vermiculite and talc from the Piedmont and montmorillonite from the Coastal Plain and/or paralic sediments characterize the upstream and intermediate areas of mixing within the estuaries. Decreasing flow velocity and flocculation of the clays, probably induced by salinity changes, results in a general change in bottom sediments from sand in the rivers to clay in the estuaries. Sands and silt fractions are high in quartz with significant amounts of feldspar in the Altamaha (Piedmont source). Heavy-mineral composition of these sediments reflects the proportionality of the division of the drainage basins between the Piedmont and the Coastal Plain. The Piedmont is characterized by unstable suites, whereas the Coastal Plain contributes stable to ultrastable assemblages. Sorting is generally poor reflecting a variety of processes which influence the sediments within the estuary. Shoreward transport, especially for the fine fraction, is an important process in determining the composition of the estuarine sediments. (Knapp-USGS)
W71-10716

A TEXTURAL STUDY OF MARINE SEDIMENTS IN A PORTION OF CARDIGAN BAY (WALES),
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 02J.
W71-10717

BIOCHEMISTRY OF SEDIMENT SAMPLES FROM BROADKILL MARSH, DELAWARE,
Delaware Univ., Newark, Dept. of Geology; and Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
Frederick M. Swain.
Journal of Sedimentary Petrology, Vol 41, No 2, p 549-556, June 1971. 8 p, 3 fig, 6 tab, 24 ref. Grant No 2-970-339 Ocean Themis Project at Univ of Del.

Descriptors: *Marshes, *Swamps, *Biochemistry, *Organic matter, Biodegradation, Sedimentation, Algae, Grasses, Tidal effects, Peat, Wetlands, Ecology, Coastal marshes, Estuaries, Marsh plants.

The later Holocene sedimentary succession beginning about 2500 years B.P. in Broadkill Marsh, Sussex County, Delaware consists of tidal-creek clays and silts about 12 feet thick, overlain by 5 feet of interbedded thin peats and silty clay of salt marsh origin. The peats are formed of remains of marsh grasses Spartina, Disticlis, and Phragmites and of marine algae and pondweeds. The carbohydrate and protein amino acid residues are much lower in total amount than those of comparable peat deposits of freshwater marshes, which suggests that degradation of these components is more rapid in the tidal marine environment than in freshwater marshes. Polysaccharide residues are scarce to absent in much of the sediment-sequence just as in freshwater sediments, but small amounts of laminaran, starch and cellulose were found in peat about 2 feet below the present marsh surface. Chlorophyll-derived pigments are lower and carotenoid pigments are much lower than in freshwater sediments of similar organic contents; which are further indications of the relatively unfavorable conditions for preservation of certain organic components in the tidal environment. (Knapp-USGS)
W71-10719

COMPARISON OF STRATIGRAPHIC AND ELECTRON MICROSCOPIC STUDIES IN VIRGINIA PLEISTOCENE COASTAL SEDIMENTS,
Queens Coll., New York. Dept. of Earth and Environmental Sciences.
For primary bibliographic entry see Field 02J.
W71-10729

EVALUATION OF RANDOM SELECTION OF DATA ON CURRENTS ON ESTUARY AND COASTAL SECTORS OF THE SEA (OB OTSENKE SLUCHAINOI VYBORKI NABLYU NAD TECHENIYAMI NA USTEVOM VZMORE I V PRIBREZHNOI ZONE MORYA),
N. A. Skriptunov.
Available from the National Technical Information Service as AD-722 836, $3.00 in paper copy, $0.95 in microfiche. Naval Oceanographic Translation 484, 1971. Trans. from Trudy, Gosudarstvennyy Okeanograficheskiy Institut, Vol 89, p 72-80, 1967.

Descriptors: *Ocean currents, *Estuaries, *Coasts, *Flowmeters, Flow rates, River flow, Velocity, Climatology.
Identifiers: *River currents, Statistical processes, Stability, USSR.

Random selection of data on currents in estuary and coastal areas is evaluated. The method used in the appraisal is based on factors that determine sea currents. Evaluations of data on currents by the application of the recommended method are illustrated by typical examples.
W71-10774

ECOLOGY AND DISTRIBUTION OF ALGAE ON THE CONTINENTAL COAST OF THE SEA OF OKHOTSK,
Naval Oceanographic Office Washington, D.C.
V. B. Vozzhinskaya.
Available from the National Technical Information Service as AD-719 986, $3.00 in paper copy, $0.95 in microfiche. Naval Oceanographic Translation 450. 33 p. Translated from Trudy Institute Okeanologii, Vol 81, p 153-175 (1966).

Descriptors: *Algae, *Ecology, *Estuaries, *Seawater, Tides, Coasts, Fog, Solar radiation, Lichens, Grasses.

Identifiers: *Okhotsk Sea, Ocean currents, Surface temperature, Marine biology, USSR.

The ecology and distribution of marine bottom flora along the continental coast of Okhotsk Sea are discussed. There are five coastal regions with different composition of algae and their distribution within supralitoral (spray - zone), litoral (intertidal - zone) and sublitoral (subtidal zone): southwestern, northwestern, northern, northeastern, southeastern coasts. The main belts of algae are as follows: Urospora penicilliformis, Gloiopeltis capillaris, Heterochordaria abietina, Corallina pilulifera, Fucus evanescens, Porphyra sp., Diatomeae, Halosaccion spp., Lessonia laminarioides, Laminaria spp., Alaria spp., species of Rhodophyta. In spite of the algae there are lichens (Placoma and Caloplaca) in supralitoral, and marine grasses (Zostera marina) in the sublitoral. The distribution of algae on continental coast depends greatly on the origin of substratum, rhythm of tides, light, current, temperature, fog, solar radiation.
W71-10793

MACROZOOPLANKTON AND SMALL NEKTON IN THE COASTAL WATERS OFF VANCOUVER ISLAND (CANADA) AND WASHINGTON, SPRING AND FALL OF 1963,
National Marine Fisheries Service, Seattle, Wash. Biological Lab.
Donald S. Day.
Available from the National Technical Information Service as COM-71-00283, $3.00 in paper copy, $0.95 in microfiche.

Descriptors: *Aquatic life, *Zoo plankton, *Nekton, Fishing, Food webs, Washington, Marine biology, Aquatic animals, Sampling, Data collections.
Identifiers: *Ocean environments, Fishing grounds, Food supply, Seasonal variations, British Columbia, Vancouver Island.

Eight species of euphausiids, 5 species of mysids, and 14 species of fish were identified. Euphausiids composed about 90 percent by number of the organisms caught, and fluctuations in their abundance were concomitant with changes in the biomass of the samples. The bulk of the organisms collected at night were in the upper 30 m. All species were taken by a 0.9-m. Isaacs-Kidd midwater trawl. The concentration of organisms was lowest near shore, reached a maximum at or near the outer edge of the continental shelf, and decreased again farther offshore. The concentration of organisms was greater in the southern part of the region than in the northern part. This distribution was apparently related to the general surface circulation. Seasonal fluctuations were indicated by a decrease in biomass from spring to fall.
W71-10794

CONVERSION OF OLEIC ACID TO SATURATED FATTY ACIDS IN SEVERN ESTUARY SEDIMENTS,
Bristol Univ. (England). Organic Geochemistry Unit; and Bristol Univ (England). Dept. of Biochemistry.
M. M. Rhead, G. Eglinton, G. H. Draffan, and P. J. England.
Nature, Vol 232, No 5309, p 327-330, July 30, 1971. 4 p, 3 tab, 28 ref.

Descriptors: *Sedimentology, *Sediments, *Estuaries, *Chemical reactions, Water chemistry, Plants, Biochemistry.
Identifiers: *Estuary sediments, Oleic acid, Fatty acids.

The ratios of H-3 to C-14 measured for the various saturated fatty acids obtained were compared, with the H-3/C-14 ratio for the original oleic acid. The results indicate that hydrogenation processes play a part in the early diagenesis of fatty acids. It seems likely that saturated geolipids may have a dual origin--biologically effected hydrogenation during early diagenesis and thermally and catalytically induced hydrogen transfer processes during maturation. These hydrogenation processes are the only ones tenable unless biological sources can be found for fully saturated geolipids such as steranes, triterpanes and tetraterpanes and related compounds. (Woodard-USGS)
W71-10818

LONGITUDINAL DISPERSION IN NON-UNIFORM FLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05B.
W71-10822

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INVESTIGATION OF ION MOBILITY IN AQUEOUS SOLUTIONS,
Tyco Laboratories, Inc., Waltham, Mass.
S. B. Brummer, and A. B. Gancy.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.25. OSW Research and Development Progress Report No. 643, March 1971, 120 p, 42 fig, 96 ref. OSW Contract No. 14-01-0001-966.

Descriptors: *Electrical properties, *Electrolytes, *Physicochemical properties, Aqueous solutions, Ion transport, Saline water, Desalination.
Identifiers: Ion mobility, Conductance.

Ionic mobility in saline solution was investigated. The conductance of these solutions was studied, and the results are analyzed in terms of theories of ion-water interactions. The conductance was studied of the electrolytes LiCl, NH4Cl, NaCl, KCl, RbCl, Et4NCl, CsCl, KF, KBr, KI and KNO3 in sufficiently dilute solutions to allow extrapolation to infinite dilution. Experiments have been carried out in the ranges 3 to 55 degrees C and to 2200 atm. New experimental techniques were developed which have substantially improved the state of the art and which allow the routine determination of conductances at infinite dilution, to within 0.1%. Three factors were necessary to obtain this high accuracy: (1) well constructed electrode seals, (2) the elimination of weak electrolyte contamination, including effects from dissolved O2, and (3) the adequate allowance for the variation of cell constant with pressure. Procedures for obtaining the requisite accuracy are described. Contrary to general belief, the pressure coefficient of conductance should increase with increasing concentration in dilute solutions. This expected behavior was found experimentally. (McCoy-OSW)
W71-10656

ECONOMIC ANALYSIS OF THE MEMBRANE WATER DESALTING PROCESSES,
Stanford Research Inst., Menlo Park, Calif.
C. F. Clark.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.75. OSW Research and Development Progress Report No. 638, December 1970, 82 p, 17 fig, 21 tab, 15 ref. OSW Contract No. 14-01-0001-2625.

Descriptors: Municipal water, Water purification, Desalination, Economic efficiency, Membrane processes, Electrodialysis, Reverse osmosis, Desalination processes, Brackish water, Tertiary treatment, Costs, Operating costs, Demineralization.

This is an updating of an earlier economic analysis by the same investigator of the two processes, electrodialysis and reverse osmosis, which employ semi-permeable membranes for the partial desalination and demineralization of brackish feed waters. The earlier work was performed in 1967 and reported in OSW R and D Report No. 495. At present the electrodialysis process has a slight cost advantage over the reverse osmosis process for the partial demineralization of brackish feedwaters in the 1000-2500 ppm TDS range to levels within USPHS standards, based on the economic ground rules assumed. Alternatively, the reverse osmosis process is the more advantageous when applied to feedwaters above the 3000 ppm TDS level. A shift is forecasted in the break-even point in favor of reverse osmosis at some future date because of the relative amounts of research and development effort being applied to each process and the relative newness of the reverse osmosis demineralization technology. (Miller-OSW)
W71-10657

COST OF STEAM SUPPLY FOR DESALTING USING COAL FIRED BOILERS,
Sanderson and Porter, Inc., New York.
Peter Sichel, and George Nagelberg.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $5.25. Jointly supported by the Office of Coal Research. Office of Saline Water Research and Development Progress Report No. 634, December 1970, 208 p, 25 fig, 42 tab, 11 ref. OSW Contract 14-01-0001-2187.

Descriptors: *Desalination, Economics, *Distillation, *Physical-chemical separation, *Coal fuel, Boilers, Steam turbines, Costs, Operating costs.

This parametric study explores the cost of steam supplied from coal fired boilers for water-only and dual purpose water/power plants. Cost of desalted water is estimated in both cases, for the latter by the power credit method. Water-only plants of 8 MGD, 50 MGD and 250 MGD capacities examined were VC-VTE-MSF design, in which the vapor compressors are driven by turbines. Dual purpose plants were examined employing VTE-MSF desalting equipment together with 25 MWe, 200 MWe and 1000 MWe power plants using back-pressure turbines. The respective desalting capacities are 8 MGD, 50 MGD and 250 MGD. Thermal cycles and initial steam conditions were optimized for various fuel costs and fixed charge rates. Optimized coal fired electric generating units provided the base for establishing the power credit values. Water costs from dual purpose plants are found to be consistently lower than those from single purpose plants. Water costs from coal fired plants could be further reduced utilizing lower water/power ratios than those analyzed in this study. For high water/power ratios the use of thermally less efficient cycles including nuclear reactors or gas turbines should be considered.
W71-10658

THE EFFECT OF AEROBIC MARINE BACTERIA ON THE CORROSION OF METALS IN SEA WATER,
Miami Univ., Fla.
K. G. Compton.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.45. Office of Saline Water, Research and Development Progress Report No. 662, May 1971, 23 p, 16 fig, 4 tab, 16 ref. OSW Grant N. 14-01-0001-1735.

Descriptors: *Desalination, *Corrosion, *Iron bacteria, Steel, *Aerobic bacteria, Sea water, Aluminum, Slime, Marine bacteria, Stainless steel.

Corrosion rates have been compared between specimens exposed to aerated seawater drawn from a local tidal channel and to water from the same source after Millipore filtration to remove all living biological matter. No differences were found for carbon steel in the two environments. A limited study suggests that the corrosion of 5052 aluminum

may be accelerated by the presence of bacteria. Microbiological aggregates including slimes were observed on aluminum and stainless steel specimens using light microscopy and dye stain techniques. Corrosion rates were estimated by the polarization resistance method. (Filban-OSW)
W71-10659

MOLECULAR INTERACTIONS IN MODEL AND NATURAL BIOLOGICAL MEMBRANES,
Case Western Reserve Univ., Cleveland, Ohio.
J. E. Zull.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No. 652, May 1971, 85 p, 36 fig, 11 tab, 94 ref. OSW Contract 14-01-0001-1285.

Descriptors: *Membranes, *Biological membranes, Semipermeable membranes, Films, *Membrane processes, Desalination processes, Spectroscopy, Analytical techniques.
Identifiers: *Model membranes, Membrane protein, Erythrocyte membranes.

Various aspects of the molecular nature of biological membranes have been investigated: a. A theoretical study predicts that cells with high amounts of surface choline will be less adhesive than cells with higher amounts of ethanolamine. This prediction is consistent with data in the literature on pneumococcus. b. A molecular interaction between cholesterol and lecithin was discovered. The sterol hydrogen bonds to the phospholipid to form a 2:1 complex (cholesterol:lecithin). This fact and indirect evidence suggest that the atoms in lecithin involved in this interaction are the oxygens of the phosphate ester. c. Infrared spectra of erythrocyte membranes suspended in D2O show that the membrane protein probably exists primarily in the random coil configuration. However, significant amounts of both a-helix and -antiparallel sheet may also be present. The latter appears to disappear when the membranes are dried, or lyphylized. d. A model lipoprotein membrane has been constructed from phospholipid liposomes and bovine serum albumin. This model system exhibits the property of having both function and structure apparently directly related to the protein conformation. Confirmation can be changed by altering hydrogen ion concentration and the resultant alterations in the lipoprotein membrane monitored. e. The erythrocyte membrane protein, spectrin, interacts with liposomes to form a lipoprotein membrane. The data suggest that spectrin interacts hydrophobically with the model membrane. (Kindley-OSW)
W71-10660

DEVELOPMENT OF A THIN-LIQUID-FILM MEMBRANE DEVICE FOR REVERSE OSMOSIS,
Dorr-Oliver Inc., Stamford, Conn.
D. S. Davies, and I. Bemberis.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.50. Office of Saline Water Research and Development Progress Report No 671, April 1971, 96 p, 28 fig, 37 tab, 18 ref, append. OSW Contract 14-01-0001-1813.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, *Pilot plants, Thin films, Saline water, Waste water treatment, Costs, Desalination plants, Osmosis, Sea water, Operating costs.
Identifiers: Cellulose acetate membranes, Channel spacings.

Field testing was conducted of a thin-liquid-film reverse osmosis pilot plant designed and built under a prior program and reported in OSW Progress Report No. 420. The pilot plant, of a nominal 1000 gpd capacity, was operated on seawater using cellulose acetate membranes. Channel spacings ranging from 0.007 in. to 0.022 in. were employed and the feasibility of operating within these narrow spacings was satisfactorily demonstrated. Cost estimates were prepared to indicate effects of narrow channel concepts on large reverse osmosis plant economics. In general the narrow channels showed only marginal advantages over the more conventional designs. (Sieveka-OSW)
W71-10661

TEST EVALUATION OF 2,500 GPD SEAWATER REVERSE OSMOSIS UNIT,
Naval Civil Engineering Lab., Port Hueneme, Calif.
Allens S. Hodgson, and D. Pal.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No. 674, April 1971, 109 p, 35 fig, 3 tab, 15 ref, 6 append. OSW Contract 14-01-0001-1776.

Descriptors: Desalination, *Reverse osmosis, *Pilot plants, *Membrane processes, *Osmosis, Sea water, Saline water, Membranes, Corrosion, Desalination plants, Operations, Pre-treatment (Water).

A two stage seawater reverse osmosis unit has been operated on a continuous basis to determine the design integrity of the unit and its components, effective service life of the membranes and optimum cleaning and pretreatment methods. The high operating pressure of the first stage of the unit (1000 - 1200 psi) combined with the corrosive nature of seawater resulted in many problems. Several first stage modules suffered structural failure and membrane failures occurred regularly. Corrosion of first stage auxiliary components required repairs to be carried out on a continuous basis after the first few hundred hours of operation. The second stage, operating at a lower pressure (600 - 700 psi), with less concentrated brine had fewer module failures and operation was relatively simple. The average effective service life of the membranes has been determined as 750 operating hours although several modules were ineffective after only a few hours and others were serviceable for longer periods of time. A review of reverse osmosis membrane cleaning procedures was carried out and several methods have been tested. (Sieveka-OSW)
W71-10662

THE IMPROVEMENT OF SPIRAL-WOUND REVERSE OSMOSIS MEMBRANES MODULES,
Gulf General Atomic Inc., San Diego, Calif.
G. E. Foreman, S. S. Kremen, A. B. Rideinger, R. L. Truby, and W. W. Wright.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Office of Saline Water Research and Development Progress Report No. 675, April 1971, 91 p, 37 fig, 16 tab, 3 ref. OSW Contract 14-01-0001-2204.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, *Membranes, Osmosis.
Identifiers: *Module design, Membrane modules.

The work covered (1) incorporating and evaluating candidate brine-channel spacer materials; (2) screening, modifying, and evaluating membrane-support fabrics, with particular emphasis on whether they are suitable as elements of film-fabric composites, and whether they have increased intrusion resistance; (3) developing procedures, selecting fabrics, and determining casting solution properties that have the capability to case membrane on support sheets; (4) evaluating module performance capability under many combinations of time, pressure, temperature, module configuration, module components, and feed-stream composition; (5) heat treating of membrane modules after fabrication. The most significant advance was the demonstrated ability to cast the membrane directly on the support sheet material. (See also W71-10664) (Sieveka-OSW)
W71-10663

DEVELOPMENT AND TESTING OF LARGE SPIRAL-WOUND REVERSE OSMOSIS MODULES,
Gulf General Atomic, Inc., San Diego, Calif.
G. E. Freeman, S. S. Kremen, and J. F. Loos.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.60. Office of Saline Water Research and Development Progress Report No. 677, April 1971, 53 p, 22 fig, 13 tab, 2 ref. OSW Contract 14-01-0001-2107.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, *Pilot plants, Osmosis, Membranes, Operations.
Identifiers: *Module design, Membrane modules.

This report covers research and development work on large spiral-wound modules as membrane supports for reverse osmosis. The development work covers fabrication of test modules of 100 feet to 150 feet of membrane area. Tests were made on tap and brackish waters with module designs using a single-leaf as a basic configuration but employing as many as 4 leaves in a single module. Long term tests on a brackish water were successfully completed with the test modules. (See also W71-10663) (Sieveka-OSW)
W71-10664

INTAKE SYSTEMS FOR DESALTING PLANTS,
Dow Chemical Co., Midland, Mich.
B. P. Shepherd, P. G. LeGros, J. C. Williams, C. Mangum, and W. F. McIlhenny.
For sale by Supt. of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $3.50. Office of Saline Water Research and Development Progress Report No. 678, April 1971, 222 p, 55 fig, 22 tab, 20 ref. OSW Contract 14-30-2579.

Descriptors: *Desalination, *Intakes, Intake structures, *Fouling, Economics, Costs, Design, Drilling, Desalination plants.
Identifiers: Intake systems (Lagoon type), Intake systems (Shore type), Intake systems (Pipe type).

The fundamentals of seawater properties, oceanographic principles, materials selection, fouling and boring control and trash removal relative to seawater intake systems are presented. Design and cost estimates are given for three basic types of intakes (lagoon, pipe, and shore) for capacities of 20 MGD and 100 MGD in representative geographical locations. Fouling was found to be the greatest problem area. The preferred basic materials of construction are concrete and steel. Coatings and cathodic protection can greatly extend the life of steel and some alloys when properly applied and used. The largest single factor influencing selection of type of intake is the nature of the site. (Gransee-OSW)
W71-10665

EFFECT OF TURBULENCE PROMOTERS ON LOCAL MASS TRANSFER,
Ionics, Inc., Watertown, Mass.
Paul H. Bradley, John L. Greatorex, and Frank B. Leitz.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.45. Office of Saline Water Research and Development Progress Report No. 597, December 1970, 36 p, 19 fig, 1 tab, 6 ref. OSW Contract 14-01-0001-2174.

Descriptors: *Electrodialysis, *Electrodes, *Ion transport, *Turbulent flow, *Data processing, *Mass transfer, *Instrumentation, Data collections, *Desalination.
Identifiers: *Turbulence promoters, Concentration polarization, Segmented-electrode, Electrochemical cell, Local current density.

An instrument has been developed to measure local mass transport in a channel typical of an electrodialysis cell and to provide a detailed profile of mass transport downstream from a turbulence promoter. Generally an electrodialysis unit is run below the economic optimum current density because the diffusional transport of anions from the solution bulk to the membrane surface is insufficient. Turbulence promoters are currently used to enhance mass transport. This instrument will aid the design of improved turbulence promoters. The instrument works by analogy between a redox electrode and a polarized membrane. Potassium ferricyanide/ferrocyanide was found to give polarization curves where the current was proportional to the concentration of reducible species and almost independent of applied voltage over a range of 500 millivolts. The curves are quite reproducible in the presence of 0.1N KOH. Platinum plated nickel provides an entirely satisfactory cathode. The data accumulation system consists of a 1000 channel data logger, a teletypewriter and a time-sharing computer system. Information received from the segmented electrode is recorded on paper tape and is transferred to the computer for storage and analysis. (Horowitz-OSW)
W71-10666

CHARACTERIZATION OF CELLULOSE ACETATE BUTYRATE MEMBRANES,
Universal Water Corp., Delmar, Calif.
S. Manjikian, and M. I. Foley.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.20. Office of Saline Water Research and Development Progress Report No. 654, February 1971, 110 p, 31 fig, 15 tab. OSW Contract 14-30-2517.

Descriptors: *Reverse osmosis, *Membranes, *Semipermeable membranes, *Desalination, Permselective membranes, Saline water, Sea water, Separation techniques, Membrane processes.
Identifiers: Cellulose acetate butyrate, *Cellulosic membranes.

Three major areas of interest were investigated; these included the characterization of cellulose acetate butyrate membranes, the optimization of butyrate membrane performance and the production of tubular butyrate membranes. In addition, work was initiated on cellulose acetate - cellulose acetate butyrate bi-membranes and non-cellulosic polymers as membrane materials. In general, the rate of flux decline for butyrate membranes is somewhat greater than that for acetate membranes. By heat treating butyrate membranes at about 40 degrees C the rate of flux decline was reduced by more than 50%. Experimental cellulose acetate butyrate tubular membranes have been produced and operated successfully on feed brine solutions ranging from 3000 to 35,000 ppm. In desalinating untreated sea water, a glyoxal modified tubular butyrate membrane exhibited the following results when operated at 1500 psig: Flux, 12.0 gal/sq.ft.day, salt rejection 99.4%. Tubular butyrate membranes have shown far better compaction characteristics than flat butyrate membranes. In addition, heat treatment of these membranes at a relatively low temperature has resulted in a further reduction in compaction. (Kindley-OSW)
W71-10667

OPTIMUM CONJUNCTIVE USE OF A DUAL-PURPOSE DESALTING PLANT AND A SURFACE WATER RESERVOIR,
California Univ., Los Angeles. Dept. of Engineering Systems; and Chile Univ., Santiago.
Fereidoun Mobasheri, and Ricardo Harboe.
Desalination, The International Journal on the Science and Technology of Water Desalting, Vol 9, No 2, p 141-153, June 1971. 13 p, 4 fig, 4 tab, 13 ref.

Descriptors: *Desalination, *Reservoirs, *Conjunctive use, *Dual purpose, Water supply, Energy, Flood control, Water quality control, Costs, Dynamic programming.

A parametric dynamic programming model with a physical recursive equation was developed to determine the optimum contract levels for firm water and energy supply from a single multi-purpose surface reservoir to be operated in conjunction with a dual-purpose desalting plant. The uses of the reservoir included water supply, on-peak and dump energy supply, and flood and water quality control downstream. The physical objectives were the determination of the optimum size of a dual-purpose desalting plant, and optimum contract level for firm water and on-peak energy supply. The economic objective was the maximization of the worth of net benefits from constructing and operating the conjunctive system. This was a function of annual firm contract levels for water supply and on-peak energy, annual dump energy production, relative prices for these outputs, and the cost of constructing and operating the dual-purpose desalting plant. For the cases studied, the water cost was decreased by about 38% when conjunctive operation was carried out. The model was applied to a hypothetical system. (Veverka-Cornell)
W71-10852

3B. Water Yield Improvement

CLOUD CONDENSATION NUCLEI AND THEIR POSSIBLE INFLUENCE ON PRECIPITATION,
Hebrew Univ., Jerusalem (Israel). Dept. of Meteorology.
For primary bibliographic entry see Field 02B.
W71-10463

CALENDAR SINGULARITIES IN RHODESIAN PRECIPITATION, AND THE IMPLICATIONS.
Meteorological Service, Salisbury (Rhodesia).
For primary bibliographic entry see Field 02B.
W71-10464

THE DESIGN AND EVALUATION OF RAINFALL MODIFICATION EXPERIMENTS,
Illinois State Water Survey, Urbana.
Paul T. Schickedanz, and Floyd A. Huff.
Journal of Applied Meteorology, Vol 10, No 3, p 502-514, June 1971. 13 p, 7 fig, 8 tab, 12 ref. NSF Grant GA-1360

Descriptors: *Data collections, *Weather modification, *Cloud seeding, *Weather data, *Sampling, Evaluation, Test procedures, Theoretical analysis, Statistical methods, Probability, Depth-area-duration analysis, Frequency analysis, Illinois, Synoptic analysis.
Identifiers: Rainfall modification.

Storm rainfall data from dense raingage networks in Illinois were used to determine the length of time required to obtain significance for various increases in storm rainfall due to weather modification efforts. The primary purposes were to evaluate the effect of stratifying the storm data on the detection of seeding effects for a given design using highly accurate measurements of the rainfall parameters and to evaluate the efficiency of various rainfall parameters and the efficiency of various statistical designs in detecting various increases. The length of experimentation necessary for detection of seeding effects varies according to weather type, precipitation type, rainfall parameter, and statistical design employed. As the seeding-induced increase becomes large, the choice of stratification, rainfall parameter, and statistical design becomes less important. An evaluation procedure is recommended which incorporates desirable features from several of the designs, stratifications and rainfall parameters considered. A 20% increase in precipitation can be detected in a five-year experiment provided proper choices are made of weather types, statistical designs, data stratifications and rainfall parameters. (Knapp-USGS)
W71-10465

PRECIPITATION RESULTS OF TWO RANDOMIZED PYROTECHNIC CUMULUS SEEDING EXPERIMENTS,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Meteorological Statistics Lab; and National Oceanographic and Atmospheric Administration, Coral Gables, Fla. Experimental Meteorology Lab.
Joanne Simpson, William L. Woodley, Alan H. Miller, and Gerald F. Cotton.
Journal of Applied Meteorology, Vol 10, No 3, p 526-544, June 1971. 19 p, 8 fig, 7 tab, 46 ref. Bur of Reclam. Contract 14-06-W-176.

Descriptors: *Cloud seeding, *Evaluation, *Instrumentation, *Radar, *Weather modification, Florida, Nucleation, Silver iodide, Statistical methods, Sampling, Remote sensing.
Identifiers: Miami (Fla).

A randomized, single-cloud, dynamic seeding experiment was conducted with airborne pyrotechnics in South Florida in 1968. In the first 40 min following seeding, large increases in rainfall (about 150 acre-ft or approximately 100% per seeded cloud) were obtained by analysis with a calibrated 10-cm radar, the accuracy of which had been tested by a raingage comparison. The statistical significance of the rainfall differences was, however, marginal, ranging from 5-20% with a series of two-tailed tests. In the spring and early summer of 1970 an improved experiment was conducted in two phases. Five instrumented aircraft participated in the first phase and only two in the second. Altogether 13 seeded clouds and 16 controls were obtained. All seeded clouds reached cumulonimbus stature as did 10 of the controls. The average difference in vertical growth following seeding of seeded vs control clouds was 6200 ft, significant at the 1% level. For the first 40 min following seeding, the average seeded minus control rainfall difference is about 100 acre-ft while it is more than 250 acre-ft, or more than 100%, for the entire cloud lifetime. Significance is better than 5% for the whole cloud lifetime for the 1970 data alone and for the 1968 and 1970 data combined; it is better than 5% for the combined data for the first 40 min and better than 10% for the 1970 data alone. When the rainfall data are objectively stratified into fair and rainy days, the fair-day differences are of the order of 350-400 acre-ft and the rainy-day differences are negative. For all 1968 and 1970 data combined, the positive seeding effect is not only significant but exceeds a factor of 3. (Knapp-USGS)
W71-10466

CONTROLLING THE PLANET'S CLIMATE,
RAND Corp., Santa Monica, Calif.
J. O. Fletcher.
Impact of Science on Society, Vol 19, No 2, p 151-168, 1969. 2 fig, 18 ref.

Descriptors: *Ice break up, *Weather modification, *Atmosphere, *Hydrological cycle, *Solar radiation, Carbon dioxide, Smog, Heat transfer, Albedo, Theoretical analysis, Climatic zones, Latitudinal studies, Heat budget, Ocean circulation, Temperature, Cloud cover, Air circulation.
Identifiers: *Ocean/atmosphere system.

In an era when agricultural productivity needs are rapidly increasing, research on weather modification is extensive. The basic theme is that man is already inadvertently influencing climate and that at the present level of knowledge, it is impossible to predict the results of these unintentional inputs. The effects of increased atmospheric carbon dioxide are not obvious, or as yet, critical. Smog, which has been steadily increasing throughout the world, may be an

extremely influential factor. A reduced atmospheric transparency of only 3-4% could reduce global mean temperature by 0.4 deg. C. Increased cirrus cloudiness (vapor trails) may also be critical by effecting increases in albedo. A 1% increase in mean albedo would cool the Earth by 1.6 deg. C. Climatic variation may only be understood in terms of atmospheric circulation since it is quantitatively reflected through ocean/atmosphere heat exchange. The polar ice sheets prevent heat transfer between the underlying ocean waters and the atmosphere in winter, forcing the atmosphere to balance the radiative heat loss to space. Diminution of the polar ice packs may create more temperate climates in formerly polar regions and the spread of aridity in other regions. These and other direct and indirect effects in changes of polar ice masses are discussed in terms of past climatic cycles and future changes relative to man-caused activities. (Casey-Arizona)
W71-10483

WATER USE AND ITS PROBLEMS IN ISRAEL (IN GERMAN),
Efraim Orni.
Geographische Zeitschreift, Vol 57, No 3, p 198-204, September 1969.

Descriptors: *Climatic data, *Arid lands, *Water conservation, *Groundwater, *Water yield improvement, Salinity, Water users, Streamflow, Rainfall, Runoff, Dams, Diversion, Cloud seeding, Evaporation.
Identifiers: *Israel.

The climate of Israel varies from a Mediterranean type in the north, with wet winters and dry summers to totally arid in the central and southern parts. The needs of the country demand high efficiency in utilization of its sparse natural resources and accordingly it has the world's highest known use rate of available water. The accession of the totally arid Gaza Strip has further strained the situation. The central problem is the diversion of surplus water from the north with it's relatively poor soils to the south where soils are potentially fertile, but where local reserves are insufficient even for urban and industrial development. There are 3 major national water sources: (1) groundwater; (2) EPHEMERAL WINTER STREAMS; (3) the Jordan River and its tributaries, which are year-round streams, largely below sea level. A national system of wells, dams, diversion canals and pumping systems has evolved, but there are major problems. The waters of the Shikna Dam Reservoir filter through sandy layers effecting groundwater recharge, but silting has become a problem. Salinity is also widespread, particularly in the arid regions. A number of conventional and unconventional water conservation techniques are in use involving evaporation suppression, water recycling, flower and early vegetable cultivation under plastic cover, deep drilling in underlying Saharan sandstone, desalination and cloud-seeding. (Casey-Arizona)
W71-10505

PROJECT SKYWATER, 1970 ANNUAL REPORT.
Bureau of Reclamation, Denver, Colo. Div. of Atmospheric Water Resources Management.

Bureau of Reclamation Atmospheric Water Resources Management Report REC-ERC-71-2, February 1971. 532 p.

Descriptors: *Cloud seeding, *Weather modification, Climatology, Cloud physics, Research and development, Model studies, Ecology, Water resources development, Statistical methods, Evaluation, Contracts, Grants, Allotments, Instrumentation.
Identifiers: *Project Skywater.

The fiscal year 1970 activities and accomplishments of the Bureau of Reclamation's Atmospheric Water Resources Program are presented. The objective of this weather modification program is to provide precipitation management technology for use in solving the Nation's water resources problem. A short introductory section summarizes activities in the categories of winter field programs, summer field programs, nonfield programs, and pilot projects. The bulk of the document consists of reports prepared by Bureau of Reclamation contractors in which they summarize their FY 1970 activities. (Knapp-USGS)
W71-10575

A NOVEL APPROACH TO EVAPORATION CONTROL WITH MONOMOLECULAR FILMS,
Naval Research Lab., Washington, D.C.
William D. Garrett.
Journal of Geophysical Research, Vol 76, No 21, p 5122-5123, Jul 20, 1971. 2 p, 9 ref.

Descriptors: *Evaporation control, *Monomolecular films, *Lipids, *Alcohols, Reservoir evaporation, Water conservation, Evaporation, Waves (Water), Mixing.
Identifiers: Water suppression.

Monomolecular films of the n-alkanols lose their ability to retard evaporation from a wind-swept, wave-covered body of water. It is proposed, however, that 'fluid' monomolecular films can endure at greater wind velocities and decrease evaporation by retarding small wave formations and breaking waves, processes which normally enhance water-vapor transport into the atmosphere. (Knapp-USGS)
W71-10703

LOPEZ WATER SUPPLY PROJECT--SAN LUIS OBISPO COUNTY, CALIFORNIA,
Koebig and Koebig, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W71-10746

LAKE ONTARIO SEEDING TRIALS - 1971.
National Oceanic and Atmospheric Administration, Miami, Fla. Research Flight Facility.

Available from the National Technical Information Service as COM 71-00487, $3.00 in paper copy, $0.95 in microfiche. Operations plan, 1 Feb 71, 27 p. NOAA/RFF-OPS Plan-3-71 NOAA-71030116.

Descriptors: *Cloud seeding, *Great Lakes, *Nucleation, *Cloud physics, Silver iodide, Carbon dioxide, Condensation, Supercooling, *Lake Ontario.
Identifiers: Stratocumulus clouds, Dry ice, Airborne, Condensation nuclei.

The static calibration of airborne nuclei generators in cold chambers and in laboratory experiments yields widely different results for the efficiency of various devices. In order to compare these techniques against each other objectively, it is proposed to conduct simultaneous seeding operations into a well defined stable supercooled stratacumulus cloud deck and to compare the results by observation and through measurements of the crystal concentrations which have been achieved within the cloud deck.
W71-10768

FLORIDA CUMULUS SEEDING EXPERIMENT 1970: SILVER CONTENT OF PRECIPITATION,
Miami University, Fla. Rosenstiel School of Marine and Atmospheric Sciences.
H. Gote Ostlund and Robert D. Stearns.
Available from the National Technical Information Service as AD-721 740, $3.00 in paper copy, $0.95 in microfiche. Naval Research Laboratory Contract Rept no ML-71021, Mar 1971. 12 p. Contract N00173-70-C-0684.

Descriptors: *Artificial precipitation, *Cloud seeding, *Silver iodide, Raindrops, Sampling, Evaporation, Weather modification.
Identifiers: Detection, Atomic spectroscopy, Absorption, Sensitivity, Cumulus clouds, Florida.

Evaporation of rainwater samples is a feasible method for the enrichment of silver. Atomic adsorption is easily brought to a sensitivity of 10-10 g of Ag or better as a limit of detection. The aircraft sampling problem is presently the worst obstacle. Adsorption on plumbing and sample containers on board the aircraft can very efficiently remove all or part of the silver from each sample. This is the problem that has to be solved before useful results can be obtained of presence of silver in seeded rain.
W71-10779

CORRELATIONS OF YIELD WITH PRECIPITATION AND OTHER METEOROLOGICAL INDICES (K voprosu o korrelyatsionnykh svyazyakh urozhaya s osadkami i drugimi meteorologicheskimi elementami),
Odessa Hydrometeorological Inst., USSR. Gidrometeorologicheskii Institut, Odessa (USSR).
For primary bibliographic entry see Field 02B.
W71-10837

MASS TRANSFER FROM ROUGH SURFACES,
Colorado State Univ., Fort Collins. Coll. of Engineering.
For primary bibliographic entry see Field 02D.
W71-10913

3C. Use of Water of Impaired Quality

THE FALL AND RISE OF SEWAGE SALVAGE,
For primary bibliographic entry see Field 05D.
W71-10507

QUALITY RATING OF IRRIGATION WATER,
Indian Agricultural Research Inst., New Delhi.
T. D. Biswas, and B. L. Jain.
Science and Culture, Vol 35, No 10, p 541-549, October 1969. 3 fig, 4 tab, 25 ref.

Descriptors: *Irrigation water, *Chemical properties, *Crop response, *Soil properties, *Irrigation practices, Salinity, Alkalinity, Cations, Sodium compounds, Conductivity, Magnesium, Calcium, Bicarbonates, Chemical analysis, Water quality, Analytical technique, Boron, Chlorides, Sulfates, Salt tolerance.
Identifiers: *India, *Sodium adsorption ratio, *Exchangeable sodium percentage.

Only 19.1% of the total cultivated land of India is irrigated, and population pressures not only dictate that more land must be brought under irrigation but that presently irrigated lands do not suffer soil deterioration as a result of the slow processes of alkalinization or salinization. This paper presents a compilation of the important criteria developed in various laboratories around the world for quality rating of irrigation water, together with critical appraisals of such indices in terms of their proper utilization. In doing so, 4 crucial points must be kept in mind: (1) nature of the water, (2) nature of the soils, (3) crops grown, (4) water application method. The best initial estimates of water suitability may be guessed from electrical conductivity measurements. This alone is inadequate. Concepts and determinations of Na hazards are discussed. Graded curves are presented of salinity and alkalinity quality class ratings expressed in the form of Na absorption ratio values. The significance of bicarbonates, boron, chlorides and sulfates are discussed. The relative tolerance of crops to salinity is then tabulated. (Casey-Arizona)
W71-10508

USE OF HIGH SALINITY WATER FOR IRRIGATION (Ispol'zovaniye vody povyshennoy mineralizatsii v tselyakh orosheniya),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).

O. G. Grammatikati, V. A. Yemel'yanov, and G. S. Nesterova.
Gidrotekhnika i Melioratsiya, No 3, p 59-66, March 1971. 8 p, 3 tab.

Descriptors: *Saline water, *Water quality, *Irrigation practices, *Irrigation water, *Salinity, Salts, Crop production, Farm management, Fresh water, Sea water, Crop response, Humid areas, Leaching, Foreign countries, Foreign research, United States.
Identifiers: *USSR, Vologda Oblast, Leningrad Oblast, Novgorod Oblast, Tunisia, India, Italy, Israel, Spain, Mineralization.

The usefulness of saline water for irrigation is determined by the interaction of numerous factors including (1) total salt content of water, (2) chemical composition of water, (3) particle-size composition and water-physical properties of soil, (4) salt content and composition of soil, (5) climate, (6) extent of area drainage, (7) amount of irrigation water, (8) irrigation practices, and (9) crop management and response. The mineralization of the groundwaters used in 1958-64 to irrigate various crops in the humid regions of the Vologda, Leningrad and Novgorod Oblasts varied between 0.35 and 20.0 g/liter. The yield of rye, wheat, barley, pea, cabbage, potato, and tomato, irrigated at low saline water application rates (150-300 cu m/ha) was 15-60% higher than that in the control. In 1961-63 the rye yield from a saline water irrigation was 15-22 cntr/ha as compared with 10-15 cntr/ha obtained from a fresh water irrigation. High salinity water (4-6 g/liter) may be used in irrigated agriculture in many regions of the USSR, privided strict measures are observed to prevent salt accumulation in the root zone. (Josefson-USGS)
W71-10589

SALT ACCUMULATION IN SOILS AND GROUNDWATER OF IRRIGATED AREAS OF RIVER VALLEYS IN TADZHIKISTAN (Protsessy solenakopleniya v pochvenno-gruntovykh vodakh na oroshayemykh zemlyakh rechnykh dolin Tadzhikistana),
Tadzhik Scientific Research Inst. of Soil Science, Dushambe.
For primary bibliographic entry see Field 02G.
W71-10832

RESULTS OF LARGE-SCALE LEACHING OF NEWLY IRRIGATED LAND IN THE GOLODNAYA STEPPE (Rezul'taty proizvodstvennykh promyvok na zemlyakh novogo orosheniya Golodnoy stepi),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 04A.
W71-10833

3D. Conservation in Domestic and Municipal Use

ASSESSMENT ANALYSIS FOR WATER SUPPLY ALTERNATIVES,
Army Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-10511

THE EFFECT OF PRICE ON LONG RUN WATER SUPPLY BENEFITS AND COSTS,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06B.
W71-10513

A GEOGRAPHICAL SYSTEMS ANALYSIS OF THE WATER SUPPLY NETWORKS OF THE NEW YORK METROPOLITAN REGION,
Columbia Univ., New York. Dept. of Geography.
For primary bibliographic entry see Field 06D.
W71-10519

INSTITUTIONAL PATTERS IN EVOLVING REGIONAL PROGRAMS FOR WATER RESOURCE MANAGEMENT,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W71-10642

ASSESSMENT ANALYSIS FOR WATER SUPPLY ALTERNATIVES,
Corps of Engineers, Alexandria, Va. Inst. of Water Resources; and Colorado State Univ., Fort Collins; and Washington State Univ., Pullman.
For primary bibliographic entry see Field 06A.
W71-10858

MULTISTAGE MARGINAL COST MODEL OF INVESTMENT-PRICING DECISIONS: APPLICATION TO URBAN WATER SUPPLY TREATMENT FACILITIES,
Cornell Univ., Ithaca. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 05F.
W71-10861

3E. Conservation in Industry

BENEFICIAL USES OF WASTE HEAT--AN EVALUATION,
Environmental Protection Agency, Corvallis, Oregon. Pacific Northwest Water Lab.
For primary bibliographic entry see Field 05D.
W71-10748

3F. Conservation in Agriculture

THE DUST BOWL IN THE 1970s,
Minnesota Univ., Minneapolis. Dept. of Geography.
John R. Borchert.
Presidential Address, 66th Annual Meeting, Association of American Geographers, San Francisco, August, 1970. Annals, Association of American Geographers, Vol 61, No 1, p 1-22, March 1971. 13 fig, 3 tab, 110 ref.

Descriptors: *Grasslands, *Droughts, *Great Plains, *Cycles, *Water resources development, Semiarid climates, Social aspects, Migration, Weather patterns, Credit, Economics of scale, Crop response, Wheat, Cattle, Federal government, Irrigation programs, Economic impact, Subhumid climates, Diversification, Management, Rainfall, Municipal water, Soil erosion, Geographical regions.
Identifiers: *Dust Bowl, *Crop subsidies, *Drought perception.

Major droughts have periodically struck the Great Plains and bordering prairie areas in cyclical sequences. The midpoints of the past 4 major extensive drought periods were 1892, 1912, 1934 and 1953, and the mean interval between midpoints is 21 years. These rhythmic occurrences are associated with contemporaneous rhythmic shifts of meridional and zonal atmospheric circulation patterns and moisture delivery on a large scale. Extrapolating from the previous records, a severe drought is indicated for the mid-1970s. During past droughts, farm production has catastrophically declined and severe strains were placed on municipal water systems. The aggregate political, social, economic and geographic effects are most clearly reflected in the fate of the individual farmer and the development of federal programs. While federal programs are designed to save existing farm units, migration out of agriculture, combined with economies of scale and new management practices have resulted in fewer, larger, more diversified farms. Indirect feed grain subsidies and crop diversification have also acted to increase livestock feeding. The economics of federal programs and farm credit are discussed. While rural populations have decreased, urban center populations have increased. Urban water supplies have been severely threatened by the droughts, but planned improvements in municipal water resources have rarely occurred. Future droughts will accelerate all of these trends. It is felt that this region may be offering a preview of the long-term behavior of developed societies as they approach resource ceilings. (Casey-Arizona)
W71-10482

KAREZES IN AFGHANISTAN (IN GERMAN),
Christoph Jentsch.
Erdkunde, Vol 24, No 2, p 112-120, 1970. 3 fig, 9 ref.

Descriptors: *Groundwater, *Social aspects, *Arid lands, *Irrigation systems, *Water distribution (Applied), Potable water, Surveys, Topography, Salinity, Water control, Water delivery.
Identifiers: *Afghanistan, *Karezes.

Karezes are groundwater canals that supply drinking water and irrigation water to arid lands. Built thousands of years ago in Iran and Afghanistan, these ingenious closed systems suffer almost no evaporative loss. They are ideally suited for supplying drinking water because there is no pollution danger and rapid water flow prevents stagnation. Afghanistan topographic survey maps published in the past few years have facilitated analyses of the distribution of these systems. Of 50,000 sq. km. of irrigated land in the country, 20% derive their water from karezes, this percentage is steadily declining because of a variety of social and technological factors. These systems are not the accomplishments of single individuals, but the results of group effort in construction and maintenance. Almost all new irrigation developments utilize modern diesel pumps imported from Czechoslovakia. As a result, the occupation of kareze building has virtually disappeared, and all current activity is largely maintenance activity involved in silt cleaning and salination prevention. (Casey-Arizona)
W71-10484

PROBLEMS OF DESERT AGRICULTURE IN PUNJAB HARYANA AND WEST RAJASTHAN,
Government Coll., Mandi, (India). Dept. of Geography.
K. L. Joshi.
Science and culture, Vol 35, No 10, p 550-555, October 1970. 3 fig, 1 tab, 2 ref.

Descriptors: *Arid lands, *Rainfall distribution, *Sands, *Cultivated lands, *Winds, Soil moisture, Deserts, Grazing, Crop response, Geographical regions, Groundwater, Semiarid climates, Runoff.
Identifiers: *India, *Rajasthan Desert, *Desertification, *Exsiccation, *Sand dunes.

Unlike many deserts, the Rajasthan Desert is a settled agricultural region where cropping and grazing are the major industries. Examination of the area reveals a random variation in distribution of cultivated acreage. Due to high irregularities in amount and distribution of rainfall, the desert sands are constantly encroaching along the discontinuous fringes of cultivated strips and the peasants are constantly involved in occupance extension during better rainfall years and struggles against incoming deterioration in poorer years. The most critical complex of varying natural factors influencing cropped areas is the periodic advance or recession of sand in proportion to wind force and locally changing direction in combination with irregularities in rainfall and underground water table. The problems facing agriculture are reviewed in detail within the broad patterns of desert formations in 4 major areas: (1) Semiarid Punjab-Haryana Margins; (2) Sandy Desert Plains; (3) Sand-free Peneplain of Midwest Rajasthan; (4) Sand dune topography of Churu. (Casey-Arizona)
W71-10486

EL DESIERTO DE SECHURA, PERU: PROBLEMS OF AGRICULTURAL USE OF DESERTS,
David H. K. Amiran.
Revista Geografica, No. 72, p 7-12, June 1970. 1 fig.

Descriptors: *Arid lands, *Irrigation practices, *Saline water, *Soil contamination, *Land use, Land management, Resource allocation, Water conservation, Cotton, Rice, Groundwater, Reservoirs, Water resources development, Water sources, Crops, Environmental effects, Evaporation, Regional analysis, Pest control.
Identifiers: *Peru, *Peruvian Desert.

Agriculture development in desert regions is subject to many problems and this is well illustrated in the agricultural development area of Piura, Peru, which is located in the Desert of Sechura, one of the widest sections of the Peruvian Coastal Desert. Established about 40 years ago, the area has 1300 farming units of 40 ha each. Cotton is the main crop, and it is irrigated by basin flooding from the Piura River. Additional water sources are wells that are suffering from severe overdrafts and consequent rising salinity levels, leading to extensive land deterioration. The river itself turns into an alkaline drainage ditch during low water season due to lack of a separate drainage system for removing used irrigation waters. A sizable storage reservoir with a capacity of 258 million cubic meters has been built at San Lorenzo, but suffers from enormous evaporative losses and an insufficient regional hydrologic data base. Amazingly, in this region sufereing from a spectrum of resource problems, there is no agricultural research station. Not far to the north, the large efficient Mallares farm (6000 ha) furnishes a startling contrast in desert agriculture. Intelligent local management results in a prosperous enterprise, integrating advanced agriculture techniques, biological pest control and minimum use of pesticides and artificial fertilizers, and first and foremost, a strict irrigation cum drainage regime. (Casey-Arizona)
W71-10490

THE CARRYING CAPACITY OF NATURAL AND IMPROVED LAND IN DIFFERENT CLIMATIC ZONES,
Melbourne University, School of Agriculture, Victoria, Australia.
M. J. Sharkey.
Mammalia, Vol 34, No 4, p 564-572, December 1970. 2 tab, 35 ref.

Descriptors: *Climatic zones, *Grazing, *Biomass, *Herbivores, *Ecosystems, *Carrying capacity, Productivity, Tropical regions, Land resources, Land management, Wildlife, Domestic animals, Arid lands, Animal populations, Tropical regions, Grasslands.
Identifiers: *Ungulates, *East Africa.

Carrying capacity is defined as the weight of animals of a single or mixed population that can be supported permanently on a given area. The existent data on carrying capacities are reviewed and tabulated for a number of climatic zones at various stages of development and at various levels of soil fertility. Wildlife carrying capacities refer to mixed herbivore populations while those of domestic ecosystems refer to a single species (sheep or cattle). In both situations carrying capacities varied widely. In the Sahara and semidesert steppes, standing crop biomass varied from 2-1,100 lb/sq mile, while it reached record levels of 104,000-108,000 lb/sq mile in east African savannahs. Due to great natural and induced levels of soil moisture and fertility, domestic ecosystems generally achieved levels 10 times higher. In arid regions, land development for grazing may not be economically feasible, and actual potential carrying capacities must be carefully reviewed. (Casey-Arizona)
W71-10497

PHYSICAL ENVIRONMENT AND ITS SIGNIFICANCE FOR ECONOMIC DEVELOPMENT, WITH SPECIAL REFERENCE TO ETHIOPIA,
For primary bibliographic entry see Field 06B.
W71-10498

GRASS SEED PRODUCTION IN NEVADA...NEVADA HAS MANY AREAS WHERE GRASS SEED CAN BE PRODUCED,
Nevada Univ. Reno. Dept of Agronomy; and Nevada Univ., Reno. Agricultural Extension Service.
E. H. Jensen, and B. Brooks Taylor.
Nevada Ranch and Home Review, Vol 4, No 4, Fall-Winter 1968-1969, p 5-7. 1 tab, 3 fig.

Descriptors: *Crop production, *Grasses, *Seeds, *Crop response, *Soil-water-plant relationships, Sprinkler irrigation, Nitrogen, Wheat grasses, Fescues, Bromegrass, Kentucky bluegrass, Profit, Economic feasibility, Planting management, Fertilization, Irrigation efficiency, Harvesting, Marketing, Emerging vegetation stage, Drying, Moisturestress, Germination, Nevada, Arid lands.

Sprinkler irrigated and nitrogen fertilized grass-seed experiments from 1965-67 at the Central Nevada Field Laboratory (Austin, Nevada) indicate that slender wheatgrass and meadow fescue were highest producers, bromegrass, tall oatgrass, tall fescue and latar orchardgrass were promising. Kentucky bluegrass offers seed production potential also. Grass seed may be economically produced in much of Nevada where markets are established. Profitable grass seed production includes good row or solid stands, seeds, seeding rate and planting, fertilization, irrigation, harvesting and marketing. Light irrigation during emergence prevents soil crusting and drying. Spring irrigation demands are low. The crop must not become moisture stressed. Good soil moisture is necessary after heading to produce full seeds. Watering should be reduced after harvesting to insure dormancy. A table shows yield, purity and germination data for 15 varieties. Photographs show 6 potentially commercial seed varieties. (Popkin-Arizona)
W71-10500

COMMUNITY RESOURCE DEVELOPMENT: EMPHASIS FOCUSES ON ECONOMIC DEVELOPMENT OF RURAL COMMUNITIES; RECREATION AREAS DEVELOPED AS TOURIST ATTRACTIONS,
Nevada Univ., Reno. Agricultural Extension Service.
L. Clair Christensen.
Nevada Ranch and Home Review, Vol 4, No 4, Fall-Winter 1968-1969, p 8-9. 2 fig.

Descriptors: *Economic impact, *Irrigation programs, *Recreation facilities, *Tourism, *Lakes, Water utilization, Non-consumptive use, Nevada, Reservoirs, Water supply, Municipal water, Employment, Financing, Fishing, Water skiing, Camp sites, Rural areas.

Emphasis is placed on developing recreation for tourists as a rural development solution to the problems of small-farm unprofitability and sagging economy. Community Resource Development began in 1957 in Lincoln County when mining shut downs caused unemployment. The development program expanded to the State of Nevada, and included federal and state agencies, and volunteer organizations such as the Resource Action Council. Activities range from construction of recreational reservoirs to municipal water systems. Eagle Valley Reservoir, funded by county, federal and private funds, is so successful in Lincoln County, that a second reservoir is planned. Over 6,000 visitors fished and water skiied in Eagle Valley in 1968. Small lakes are being connected, and a ski area is developing. Fishing reservoirs, municipal water supplies and camps were built to improve economic development in central Nevada. Irrigation projects are also sponsored. Economic guidelines are established by the program. Engineering plans are developed by the Agricultural Economics and Education Division of the College of Agriculture. Photographs show spillway and water-related recreationists on 2 community resource development reservoirs. (Popkin-Arizona)
W71-10501

POTENTIAL PHOTOSYNTHESIS AND CROP PRODUCTIVITY,
Hawaii Univ., Honolulu.
Jen-Hu Chang.
Supported by Environmental Science Service Administration Contract E-44-67G. Annals, Association of American Geographers, Vol 60, No 1, p 92-101, March 1970. 8 fig, 1 tab, 31 ref.

Descriptors: *Solar radiation, *Photosynthesis, *Producitivty, *Crop response, *Climatic data, Photoperiodism, Soil moisture, Rainfall, Model studies, Estimating equations, Light penetration, Saturation, Cotton, Rice, Sugarcane, Latitudinal studies, Tropical regions, Elevation, Environmental effects, Economic feasibility, Sugar beets, Regression analysis, Seasonal, Canopy, Temperature, Respiration.
Identifiers: *Saturation light intensity, *Developing countries, *Double-crop index.

Crop developments during successive stages of a life cycle are conditioned by different climatic factors and the values of these critical factors vary with crop species and even varieties. Assuming complete canopy cover and adequate water and nutrient supplies, it is possible to construct a family of curves expressing gross photosynthesis of sugar beets as a function of solar radiation and day lengths. Net photosynthesis is calculated by subtracting empirically-derived temperature-dependent respiration values from gross photosynthesis. Using this model with world-wide weather station data, global potential photosynthesis maps were constructed for 4- and 8-month summer growing periods. Latitudinal variations were summarized and correlations were made with several of Koppen's climatic types. Excepting the cold polar regions, the lowest 4-month values were found in the tropics, while the highest values were found along west coasts near 60 degrees latitude. For both the 8-month period and the annual mean, the Mediterranean type of climate has the highest potential productivity, and equatorial regions the lowest. Using the model, computed potential photosynthesis was correlated with actual crop yields of rice, cotton and sugarcane of leading producing countires from different latitudes. The correlations were highly significant. Most of the undeveloped countries had low potential photosynthesis and fell below the regression line, while the opposite was true for developed countries. This implies that physical factors are primary in agricultural development and must be carefully considered before development projects are undertaken. (Casey-Arizona)
W71-10502

SPATIAL ORGANIZATION OF AGRICULTURE IN SOME NORTH INDIAN VILLAGES. PART I,
Reading University, U.K., Geography Department.
Reading Univ., (England). Dept of Geography.
P. M. Blaikie.
Transactions, Institute of British Geographers, No 52, p 1-40, March 1971. 16 fig, 12 tab, 30 ref.

Descriptors: *Spatial distribution, *Farm management, *Distance, *Irrigation, *Semiarid climates, Statistical models, Correlation analysis, Crop production, Social aspects, Economic efficiency, Monsoons, Irrigation canals, Transportation, Land use, Seasonal, Crop response, Dry farming, Resource allocation, Mapping, Rainfall, Tax rate, Fallowing, Regression analysis.
Identifiers: *India, *Principal components analysis, *Locational analysis, *Crop zoning, *Movement minimization.

Agricultural spatial organization reflect an attempt at optimal resource allocation by choosing from a variety of alternate strategies. Using field data from 4 selected northern India villages, 2 in western Rajasthan and 2 in the Punjab region, an attempt was made to analyze the relevant variables involved in agricultural decision-making and thereby test a general hypothesis explaining regional spatial organizaton. The western Rajasthan region has few irrigation wells and low rainfall which is extremely variable, both temporally and spatially. Dry farming is predominant and land holdings are fractionated to ensure that at least some part of a holding will receive rainfall in any given year. Simple-crop cultivation in fields distant from the village core incurs high transport costs. By contrast, the Punjab region is characterized by more reliable rainfall, an extensive irrigation canal system, double and triple cropping and a higher proportion of cash crops. The model to be tested is a modified version of the Thunen Hypothesis, and states that as transport outlay increases with increasing distance from the cultivator's home, there will be decreases in input per hectare, manuring levels and land taxation and increases in fallowing. An interlocking design was set up using a variety of multivariate statistics, whose applicability and accuracy are discussed in detail. In the western Rajasthan villages, existence of crop zoning and observed preferred crop planning distances accorded well with the distance-decay hypothesis. In the Punjab villages, however, the hypothesis was not confirmed. Spatial variations in the presence and quality of irrigation facilities were the controlling factors in agricultural organization. (Casey-Arizona)
W71-10503

NOMADISM AND LAND USE IN SOMALIA,
Texas Technological Coll., Lubbock. International Center for Arid and Semi-Arid Land Studies.
Thadis W. Box.
Economic Development and Cultural Change, Vol 19, No 2, p 222-228, January 1971. 13 ref.

Descriptors: *Grazing, *Arid lands, *Livestock, *Land management, *Water holes, Geographical regions, Social aspects, Economic impact, Rainfall, Human population, Foreign trade, Ecosystems, Land tenure.
Identifiers: *Nomadism, *Somalia, *Camels.

The climate of Somalia is dry tropical. Annual rainfall is extremely variable, ranging from 1-24 inches per year, divided between spring and autumn rains. Only about 12% of the land is cutivatable, and livestock production, involving camels, sheep, goats and cattle, supports about 73% of the population. The Somali herdsmen have evolved a system of nomadic rotation of rangeland that results in a balance between range vegetation and animal needs. In the wet season, herds are scattered onto the ranges receiving rainfall. During the dry season clans are concentrated near their home wells over which they have primary rights. Scattering again when rains reappear relieves the grazing pressures around the waterholes. Recent studies indicate that numbers of herd animals are increasing and that a large percentage of livestock production is being sold outside the country. There are various estimates indicating that up to 90% of the hard currency coming into the country may come through sales of nomadic livestock. Recently a number of foreign studies have suggested the elimination of nomadic pastoralists and their resettlement as sedentary farmers. The author contends that under the ecologic, economic and cultural conditions now existing, nomadic land use is the best utilization of the existing resource. A system of land tenure protecting and encouraging nomadism should be initiated in conjunction with improved nomadic range management programs. (Casey-Arizona)
W71-10504

QUALITY RATING OF IRRIGATION WATER,
Indian Agricultural Research Inst., New Delhi.
For primary bibliographic entry see Field 03C.
W71-10508

RESULTS OF TESTING THE DOS-400 SPRINKLER IN THE GOLODNAYA STEPPE (Rezul'taty ispytanly dozhdeval'noy mashiny DOS-400 v Golodnoy stepl),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Khlopkovodstva, Tashkent (USSR).
V. M. Legostayev, I. S. Kalyuzhnyy, V. M. Vesmanov, K. G. Abel', and S. A. Tetevosyan.
Gidrotekhnika i Melioratsiya, No 3, p 50-58, March 1971. 9 p, 1 fig, 5 tab, 3 ref.

Descriptors: *Sprinkler irrigation, *Irrigation systems, *Irrigation effects, Evaporation, Transpiration, Furrow irrigation, Cotton, Moisture content, Discharge (Water), Equipment, Precipitation (Atmospheric), Harvesting.
Identifiers: *USSR, Kazakhstan, Golodnaya Steppe, Moisture capacity.

Evaporation losses from a soil may be reduced by decreasing the traveling speed of a sprinkler and the length of its pass. To reduce evaporation losses to a minimum and achieve a maximum application efficiency, stationary sprinkler irrigation systems may be used. The DOS-400 sprinkler, designed for use in the Golodnaya Steppe of southeast Kazakhstan, may be employed in stationary sprinkler systems when water is applied at a rate of less than 700 cu m/ha or in combination systems using stationary systems with portable sprinklers when the application rate is higher than 700 cu m/ha. The DOS-400 sprinkler is recommended for use in stationary systems when the water application rate is higher (1,000-1,200 cu m/ha), provided no surface runoff results. Changes in the present design of the DOS-400 and in its basic technical parameters are contemplated with a view toward reducing the weight of the sprinkler to 20 metric tons, increasing the discharge of water from the sprinkler to 200 liter/sec and decreasing sprinkling intensity of 0.4-0.5 mm/min. (Josefson-USGS)
W71-10590

A METHOD FOR INCORPORATING AGRICULTURAL RISK INTO A WATER RESOURCE SYSTEM,
Florida Univ., Gainesville. Dept. of Agricultural Economics.
J. R. Conner, R. J. Freund, and M. R. Godwin.
Water Resources Bulletin, Vol 7, No 3, p 506-516, June 1971. 11 p, 4 fig, 3 tab, 22 ref.

Descriptors: *Risks, *Water resources development, *Reservoirs, *Irrigation efficiency, Agricultural engineering, Simulation analysis, Planning, Optimization, Input-output analysis, Economics, Model studies, Texas, Irrigation water.
Identifiers: *Twinn Buttes Reservoir (Tex).

The objective involved identification of optimal characteristics of an irrigation reservoir (Twinn Buttes Reservoir, San Angelo, Texas), taking into account two major risk components: the variable hydrologic inputs and the economic reactions of farmers to uncertainties in water deliveries. The methodology employed consisted of a combination of simulation and response surface techniques. The development of the model and subsequent analysis procedures were divided into four phases: (1) description of the reservoir irrigation system including the characteristics of the reservoir and physical inputs and outputs; (2) description of the agricultural enterprises which receive irrigation water from the reservoir and reactions of farmers to uncertain water deliveries; (3) simulation of the system and subsequent farmer reactions including the development of necessary data inputs for simulation; and (4) investigation of optimum and near optimum reservoir-irrigation systems and an examination of the expected behavior of farmers for these systems. The results obtained indicated that the farmers' reactions had recognizable effects on both the system design variables and the farmers' own cropping plans although these reactions were not particularly strong. (Veverka-Cornell)
W71-10853

SIMULATION MODELS OF WATER SUPPLY FOR IRRIGATION IN WATER RESOURCES SYSTEMS,
Zdenek Kos.
ICID Bulletin, International Commission of Irrigation and Drainage, Chanakyapuri, New Delhi, p 47-52, January 1970. 6 p, 2 tab, 8 ref.

Descriptors: *Water supply, *Irrigation, *Model studies, *Simulation analysis, Digital computers, Costs, Irrigation efficiency.
Identifiers: *Labe River.

Digital computer simulation models of water resource systems were applied to the catchment area of the Upper and Middle part of the Labe River, where the main objective was the delivery of water for irrigation purposes. Using simulation, a method of calculating a chronological series of monthly water data compatible with the historical hydrological input data was developed. For the optimization model, the value of net gains from the water resources system discounted to the initial stage served as an objective function. For the calculation of values the usual costs and the price of water were determined. This was done in a speculative way on the basis of simulated demand curves. Two basic alternatives of the simulation model were: (1) as a static model, with constant requirements for withdrawal of water and constant capacity of dams during the life of the system; and (2) as a dynamic model, where the requirements during the life of the water resources system increased, a new dam was constructed and the time of its construction was optimalized. For the evaluation of the results, the synthetic input data were constructed and the variance of the values of the objective function were considered. The distribution curves of annual water duty were constructed to demonstrate the influence of water resources systems of the water duty. (Veverka-Cornell)
W71-10870

AN ALGORITHM FOR IRRIGATION PROJECT PLANNING,
Harvard Univ., Cambridge, Mass. Centre for Population Studies.
Peter Rogers, and Douglas V. Smith.
ICID Bulletin, International Commission of Irrigation and Drainage, Chanakyapuri, New Delhi, p 15-30, 46, January 1970. 17 p, 5 fig, 11 tab, 6 ref.

Descriptors: *Irrigation, *Project planning, *Linear programming, *Surface-groundwater relationships, Economics, Water, Crops.
Identifiers: *East Pakistan.

To examine demand for irrigation water and alternative supply sources and to provide an interface with more traditional methods of analysis, a linear programming model was developed. This deterministic and static model focussed on the interactions of a surface water-ground water system within the economic context of irrigation management. The program selected the tubewell, canal, and surface drainage capacities, the project size, and the cropping pattern. Monthly operation of the system was assumed to proceed subject to certain constraints on continuity at the river; capacity of the canals, tubewells, and drainage channels; mining of ground water; crop water requirements; availability of land of different soil types; and permissible cropping patterns. The inclusion of surface reservoirs, recharge facilities, water quality considerations and salinity intrusion were discussed. A detailed example from East Pakistan was presented together with an exploration of the sensitivity of the solution to such physical and socioeconomic variables as the sum of the subsurface return flows to the river and the non-beneficial evaporation from the water table, the substitution of wheat for rice, the level of food-grain self-sufficiency, and the design assumptions concerning rainfall and streamflow. (Veverka-Cornell)
W71-10875

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A SIMPLIFIED APPROACH TO WATER INFLUX CALCULATIONS -- FINITE AQUIFER SYSTEMS,
Phillips Petroleum Co., Bartlesville, Okla.
For primary bibliographic entry see Field 02F.
W71-10452

QUANTITATIVE METHOD FOR GRADING DRAINAGE DENSITY,
Wilkes Coll., Wilkes-Barre, Pa.
M. T. El-Ashry.
Geological Society of America Bulletin, Vol 82, No 6, p 1703-1706, June 1971. 4 p, 4 fig, 1 tab, 4 ref.

Descriptors: *Drainage density, *Geomorphology, *Drainage patterns (Geology), *Distribution patterns, Mapping, Channels, Drainage systems, Maps, Measurement, Erosion, Hydrogeology, Rainfall-runoff relationships, River systems.
Identifiers: *Hortons law.

A numerical scale for defining density is suggested to help clarify the ambiguity resulting from using the relative terms low, medium, and high drainage density. A square mile is traced on an aerial photograph or map and the number of drainageways counted. Less than 20 drainageways per square mile will indicate low density; 40 to 50, medium; more than 80, high; and more than 200 will indicate very high drainage density. Drainage density is an important aspect of drainage analysis because it provides clues as to the degree of perviousness of surface and shallow subsurface material, infiltration-runoff ratio, erosional history, and special climate conditions. For easy reference and fast results, a modification of Horton's method is suggested to be used in conjunction with drainage analysis from aerial photographs or topographic maps. A drainage map is usually helpful when analyzing aerial photographs, particularly where drainage patterns are confused or masked by other images, or in case of areas with very high density where the counting of drainageways would be much easier from a drainage map than from the photograph itself. (Knapp-USGS)
W71-10455

THE HYDROLOGY OF MARSHES AND MARSH-RIDDEN LANDS,
Belorussian Water Research Inst., Minsk (USSR). Dept. of Hydrological Research.
A. G. Bulavko.
Nature and Resources, Vol 7, No 1, p 12-15, March 1971. 4 p.

Descriptors: *Marshes, *Marsh management, *Peat, *Swamps, *Land reclamation, Hydrologic cycle, Drainage effects, River flow, Moisture, Marsh plants, Evaporation, Water balance, Heat balance, Temperate.
Identifiers: *USSR, Belorussia, Marsh hydrology.

In contrast to marsh science, which is concerned with the origin and development of marshes and the botanical composition, structure, and properties of the peat layer, marsh hydrology deals mainly with subjects relating to the water regime of marshes. These include the heat and moisture exchange between marshes and the surrounding milieu, the interaction between the liquid, solid and gaseous constituents of marshes, and the movement of water in marshes and changes in its phase composition. Research conducted in the Soviet Union has made it possible to determine the basic characteristics of the hydrologic regime of marshes and to show their influence on various components of the hydrologic cycle. Abroad, hydrological research on marshes deviates from the Soviet approach by concentrating either on problems relating purely to marsh science and the hydrophysical properties of marsh-ridden land and of drained and cultivated peat bogs, or on problems dealing with the reclamation and exploitation of drained marshes. An international symposium on the hydrology of marshes and marsh-ridden land is scheduled to be held in Minsk in the summer of 1972. The problems to be discussed include the natural water regime and water balance of peat bogs in temperate zones; drainage of peat bogs; climatic conditions of peat bogs in the temperate latitudes of the northern hemisphere; and influence of a changed water regime on the natural landscape. (Josefson-USGS)
W71-10467

AN OPTIMUM PATH TO RESERVOIR DESIGN BASED ON THE WORTH OF DATA,
Geological Survey, Fort Collins, Colo. Engineering Research Center.
Marshall E. Moss, and David R. Dawdy.
Paper presented at 7th Symposium of the Civil and Hydraulic Engineering Department, May 11-16, 1971, Indian Institute of Science, Bangalore, p D6-1 - D6-5, 1971. 5 p, 5 ref.

Descriptors: *Reservoir design, *Optimization, *Data collections, Systems analysis, Water storage, Water conservation, Streamflow forecasting, Gaging stations, Data processing.
Identifiers: *Data evaluation.

A four step procedure is given to determine the optimum design of the conservation pool of a reservoir. The criterion of optimality is to maximize the worth of data used in the design. This criterion results in maximum expected net benefit from the conservation project as a whole. Solutions of existing design problems are possible, and studies are continuing which should provide easily usable relations for completing designs by this procedure. (Knapp-USGS)
W71-10573

FLOOD PLAIN INFORMATION, LYCOMING CREEK IN LYCOMING COUNTY, PENNSYLVANIA.
Corps of Engineers, Baltimore, Md.

Army Corps of Engineers Flood Plain Report, September 1969. 51 p, 3 fig, 18 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Pennsylvania, Flood plains, Historic flood, Flood forecasting, Regional flood, Design flood, Flood control.
Identifiers: Lycoming Creek (Penn), Lycoming County (Penn), Flood profiles, Standard Project Flood, Intermediate Regional Flood.

Flooding along Lycoming Creek, in Lycoming County, Pennsylvania, from its junction with the West Branch Susquehanna River at Williamsport upstream to just above the village of Cogan Station is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Velocities of water during major floods such as the Intermediate Regional Flood would range up to 13 feet per second in the stream channel. Velocities on the flood plain would vary up to 5 feet per second but would generally be below 3 feet per second. During a Standard Project Flood, velocities in channel would range up to 15 feet per second. On the flood plain the corresponding figure would be 7 feet per second. Velocities greater than 3 feet per second combined with depths of 3 feet or greater are considered hazardous. (Woodard-USGS)
W71-10584

SPECIAL FLOOD HAZARD INFORMATION, TULSA, OKLAHOMA.
Corps of Engineers, Tulsa, Okla.

Army Corps of Engineers Flood Hazard Report, October 1970. 4 p, 8 plate.

Descriptors: *Floods, *Flood damage, *Oklahoma, Flood plains, Regional flood, Flood forecasting, Flood control.
Identifiers: *Tulsa (Okla), Standard Project Flood, Intermediate Regional Flood.

The flood situation on nine streams in the vicinity of Tulsa, Oklahoma is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, and cross sections relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall runoff historical flood heights and other technical data. (Woodard-USGS)
W71-10585

FLOOD PLAIN INFORMATION OF GRAND RIVER, RED CEDAR RIVER AND SYCAMORE CREEK, LANSING, MICHIGAN AND VICINITY.
Corps of Engineers, Detroit, Mich.

Army Corps of Engineers Flood Plain Report, April 1970. 89 p, 25 fig, 57 plate, 18 tab.

Descriptors: *Floods, *Flood damage, *Michigan, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: *Lansing (Mich), Standard project flood, Intermediate regional flood.

Flooding of the vicinity of Lansing, Michigan is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for the use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The most severe flood of record on the Grand River occurred in March 1904, which was the result of rapidly melting snow and light rainfall. The equivalent stage on the present gage at Lansing would be about 20.2 feet, and the peak discharge is estimated to have been 24,500 cubic feet per second. The duration of river stages above flood damage stage was about 6 days. (Woodard-USGS)
W71-10586

METHODS OF CALCULATING DRAIN-DEVICE SPACING (O metodakh opredeleniya rasstoyaniy mezhdu drenami),
A. A. Zibert, and Ts. N. Shkinkis.
Gidrotekhnika i Melioratsiya, No 3, p 86-94, March 1971. 9 p, 3 fig, 7 tab, 12 ref.

Descriptors: *Drains, *Drainage effects, *Land reclamation, *Fluid mechanics, *Economic feasibility, Groundwater, Soils, Discharge (Water), Topography, Particle size, Hydrogeology, Hydraulics, Land use, Moisture content.
Identifiers: *USSR, Latvian SSR, Drain spacing, Nomograms, Gleying.

The distance between drains and the depth of the drain are two important factors determining the intensity of drainage of excessively wet soils, drain-device costs, drain tile requirements and the amortization of drainage systems. In calculating distances between drains, theoretical relationships should be combined with an empirical determination of the individual parameters. Distances between drains should be calculated either from formulas derived from the laws of fluid

mechanics or from empirical relationships. Appropriate parameter coefficients may be used to determine computed drainage runoff and computed distances between drains depending upon the water supply of the area and drainage intensity requirements. Distances between drains for sandy and macroaggregate flood plain soils of the Latvian SSR can be determined by means of a graph or by nomograms in the case of cohesive mineral soils. An experimental drainage network for observing the hydrologic effects of drainage should be set up in excessively wet zones to ensure accurate calculation of optimal distances between drains. (Josefson-USGS)
W71-10588

EFFECT OF THE DRAINAGE OF PEAT SOILS IN THE MESHCHERA LOWLAND ON THEIR WATER-AIR AND NUTRIENT REGIMES (Vliyaniye osusheniya torfyanykh pochv Meshcherskoy nizmennosti na ikh vodno-vozdushnyy i pishchevoy rezhimy),
For primary bibliographic entry see Field 02G.
W71-10601

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN MARYLAND.
Corps of Engineers, Baltimore, Md.

Army Corps of Engineers Water Resources Development Report, January 1971. 82 p, 1 fig, 1 map.

Descriptors: *Water resources development, *Maryland, *Surface waters, *Projects, *Project planning, Reviews, Navigation, Flood control, Water supply, Rivers, Harbors, Driftwood, Entrophication, Beach erosion.
Identifiers: *U.S. Army Corps of Engineers.

Current information on the scope and progress of water resources development within the State of Maryland by the United States Army Corps of Engineers is presented. The projects are concerned with navigation, flood control, drift removal, removal of aquatic growth, water supply, shorelines, beach erosion control, and river and harbor development. The Corps' role in planning and building these improvements is described and the procedure for initiating and processing the improvements is explained. Information is given on the status of the various projects, whether the work is completed, is underway, or has not been started. (Woodard-USGS)
W71-10732

FLOOD PLAIN INFORMATION--COASTAL FLOODING OF THE TOWN OF CAPE CHARLES, VIRGINIA.
Corps of Engineers, Norfolk, Va.

Army Corps of Engineers Flood Plain Report, May 1970. 36 p, 5 fig, 8 plate, 3 tab.

Descriptors: *Floods, *Flood damage, *Virginia, Flood plains, Hurricanes, Wind tides, Tidal waters, Regional flood, Flood forecasting, Flood control, Historic flood.
Identifiers: *Coastal flooding, *Chesapeake Bay (Va), Standard project flood, Intermediate regional flood, Intermediate regional tidal flood.

Tidal flooding at and in the vicinity of the town of Cape Charles, Virginia is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Wave action is responsible for much of the structural damage along the shore front. The shorelines of the town of Cape Charles are exposed to wave attack from the northwest, west, and southwest. Wave runup to elevations higher than still water level is a significant factor, particularly at locations adjacent to areas of fairly deep water. (Woodard-USGS)
W71-10733

FLOOD PLAIN INFORMATION--SAGE CREEK, VOLUME II, CASPER, WYOMING.
Corps of Engineers, Omaha, Nebr.

Army Corps of Engineers Flood Plain Report, April 1970. 20 p, 4 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Wyoming, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Casper (Wyo), Standard project flood, Intermediate regional flood.

Flooding of Sage Creek, Casper, Wyoming is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. Sage Creek is a small stream passing through the eastern edge of Casper. The drainage basin is 7 miles long, about 0.6 miles wide and rises about 2,500 feet from its mouth to its source. The major floods on Sage Creek are produced by rainfall from high intensity thunderstorms and are characterized by high peak discharges of short duration. Floods may crest in as little as two hours after the beginning of rainfall and subside in less than six hours. (Knapp-USGS)
W71-10734

LOPEZ WATER SUPPLY PROJECT--SAN LUIS OBISPO COUNTY, CALIFORNIA,
Koebig and Koebig, Inc., Los Angeles, Calif.
Keith G. Tranbarger, Charles H. Lawrance, and Richard A. Drahn.
A paper presented at the 91st Annual Conference of the American Water Works Assn., Denver, Colorado, June 17, 1971. 51 p, 21 fig, 7 tab, 15 ref.

Descriptors: *Water conservation, *Flood protection, *Multiple-purpose reservoir, *Water treatment, *Water supply, Recreation facilities, Reservoir operation, Water costs, Public health, Water quality, Algal control, Reservoir fisheries, California.
Identifiers: *San Luis Obispo County, *Lopez Water Supply Project.

The $17,714,000 Lopez Water Supply project is described which has successfully combined the aspects of water conservation, public water supply, aquatic recreation, and enhancement of fish and wildlife. The project received substantial grants of state and federal monies for financial aid and reaped the benefits of an unusually productive rainy season which caused the newly completed major reservoir to fill rapidly. The Lopez Water Project regulates the flow of Arroyo Grande Creek which salvages a net annual average of 6,230 acre feet per year of safe seasonal yield which otherwise would have wasted as flood runoff; provides flood protection for 828 acres of flood plain; provides for regulated releases of flow for groundwater recharge purposes to satisfy the vested pumping rights of downstream irrigators and water purveyors; creates a multi-purpose reservoir with a 51,800 acre feet maximum pool and a 4,000 acre feet minimum pool. It also (1) creates a 900 acre feet flow through type terminal reservoir which is fed by pressure pipeline from Lopez Dam; (2) provides for bacterial and viral die-off during over thirty days of minimum, detention for up to 6.90 million gallons per day; and (3) feeds Lopez Water Treatment Plant by gravity. The project supplies wholesale filtered surface water from Lopez Water Treatment Plant to five coastal communities in South San Luis Obispo County of supplement local groundwater supplies. It also provides a recreation area covering nearly 6.7 square miles of lake shore line at full pool. (Poertner)
W71-10746

EFFECTS OF STREAM CHANNELIZATION ON FISHES AND BOTTOM FAUNA IN THE LITTLE SIOUX RIVER, IOWA,
Iowa State Univ, Ames. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W71-10751

A COMPARISON OF FIVE WATERSHEDS OF NEW MEXICO AS INTERPRETED FROM THE DISTRIBUTION OF THE SPECIES OF THE AQUATIC BEETLE FAMILY DYTISCIDAE,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 02I.
W71-10754

SOIL MOISTURE AND TEMPERATURE REGIMES ON THE LUBRECHT EXPERIMENTAL FOREST,
Montana Univ., Bozeman. Joint Water Resources Research Center.
For primary bibliographic entry see Field 02I.
W71-10755

FLOOD PLAIN INFORMATION, LAKE EARL-LAKE TALAWA AND LOWER SMITH RIVER, DEL NORTE COUNTY, CALIFORNIA.
Corps of Engineers, San Francisco, Calif.

Army Corps of Engineers Flood Plain Report, Jun 1971. 27 p, 25 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *California, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge, Lakes, Pacific Ocean.
Identifiers: *Floods (Del Norte County, Calif.), Standard project flood, Intermediate regional flood.

The flood situation in the areas bordering Lake Earl and Lake Talawa and along the Smith River from its mouth upstream for about 15 miles in Del Norte County, California is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. In the area of the lakes the duration of floods is entirely dependent on the time when the sandbar between Lake Talawa and the Pacific Ocean is breached either mechanically or naturally. During the December 1964 flood the Smith River rose about 18 feet in 18 hours with the out-of-bank stage lasting about 40 hours. (Woodard-USGS)
W71-10812

FLOOD PLAIN INFORMATION, WEST FORK WHIT RIVER, TOWN, MUD, SCULL, AND CLEAR CREEKS, FAYETTEVILLE, ARKANSAS.
Corps of Engineers, Little Rock, Ark.

Army Corps of Engineers Flood Plain Report, March 1971. 39 p, 14 fig, 26 plate, 12 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Arkansas, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Fayetteville, Ark.), Standard project flood, Intermediate regional flood.

Flooding along the West Fork of White River, Town Branch, and Mud, Scull, and Clear Creeks in and near Fayetteville, Arkansas is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The largest recorded flood on West Fork White River occurred in April 1945 with an estimated peak discharge of 53,000 cfs and a stage of 21.5 feet at the Fayetteville gage at Highway 16 bridge. The precipitation on 14 April 1945 was 6.3 inches at West Fork and 3.8 inches at the Fayetteville Experiment Station. (Woodard-USGS)
W71-10813

PRESENT METHODS AND PROSPECTS FOR COMPUTING MAXIMUM FOOD RUNOFF (O metodakh rascheta maksimal'nykh pavodkov. Sostoyaniye i perspektivy razvitiya),
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W71-10826

RESULTS OF LARGE-SCALE LEACHING OF NEWLY IRRIGATED LAND IN THE GOLODNAYA STEPPE (Rezul'taty proizvodstvennykh promyvok na zemlyakh novogo orosheniya Golodnoy stepi),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
V. A. Molodtsov, and Ye. I. Pankova.
Pochvovedeniye, No 8, p 106-118, August 1970. 3 fig, 8 tab, 4 ref.

Descriptors: *Leaching, *Drainage practices, *Drainage effects, *Subsurface drains, *Subsurface drainage, Land reclamation, Saline soils, Irrigation water, Irrigation, Drainage water, Salts, Salinity, Groundwater, Weirs, Flow rates, Soil management, Water delivery.
Identifiers: *USSR, Kazakhstan, Golodnaya Steppe, Mineralization, Drainage flow, Toxic salts, Water extracts, Temporary drains, Transverse drains.

The results of experiments designed to ascertain the effectiveness of large-scale leachings in 1967 of medium and strongly saline soils on rice fields of the Golodnaya Steppe are summarized. Leaching of soils of low permeability using deep horizontal subsurface drains spaced 120 to 140 m apart plus temporary drains extending 500 running m/ha may desalinize the top meter layer of the soil in a single season. The deeper horizons may be desalinized by using deep subsurface drains and by growing crops on the land. Temporary drainage with major leaching of saline soils removed the bulk of the water and salts; deep drainage played a secondary role during the period of major leaching. The function of subsurface drainage was to maintain the groundwater below the critical level and to remove the drainage water and salts when the leached lands were being used for crops. Deep drainage was much more efficient than shallow, temporary drainage; about 80 cu m of water was required to remove 1 metric ton of toxic salts during the leaching period as compared with 300 cu m of water required by shallow drainage. It was found that mineralization of the water in temporary drains is a reliable criterion of the salinity of the soil leached and may serve as an indication of when to stop the leaching. (Josefson-USGS)
W71-10833

OPTIMUM CONJUNCTIVE USE OF A DUAL-PURPOSE DESALTING PLANT AND A SURFACE WATER RESERVOIR,
California Univ., Los Angeles. Dept. of Engineering Systems; and Chile Univ., Santiago.
For primary bibliographic entry see Field 03A.
W71-10852

A METHOD FOR INCORPORATING AGRICULTURAL RISK INTO A WATER RESOURCE SYSTEM,
Florida Univ., Gainesville. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W71-10853

DISCUSSION ON 'STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMUM RESERVOIR OPERATION', BY WILLIAM S. BUTCHER,
Michigan Univ., Ann Arbor. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 07C.
W71-10854

OPTIMAL CAPACITIES FOR A MULTIRESERVOIR SYSTEM USING THE LINEAR DECISION RULE,
Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
Satish C. Nayak, and Sant R. Arora.
Water Resources Research, Vol 7, No 3, p 485-498, June 1971. 14 p, 1 fig, 12 tab, 7 ref.

Descriptors: *Reservoir storage, *Linear programming, *Reservoir operation, Optimization, Costs.

A chance constrained formulation of a multireservoir system was considered. Minimum and maximum release requirements, minimum pool level, and minimum freeboard capacity were specified by the management for each reservoir. The management also specified the maximum probabilities beyond which these requirements were not violated. By proposing linear decision rules for the releases, the chance constrained formulation to an ordinary linear programming formulation was reduced. The linear decision rule stated that the release from a reservoir during a given time period was defined by the difference between the 'net initial storage' and a 'decision parameter' for that reservoir during that period. The objective function considered only the total cost of reservoirs, because the primary objective was to meet the various given demands at a minimum cost. This model was applied to the Minnesota River Basin. (Veverka-Cornell)
W71-10862

SOME FACTORS INFLUENCING REQUIRED RESERVOIR STORAGE,
Washington Univ., Seattle; and Stanford Univ., Calif.
Stephen J. Burges, and Ray K. Linsley.
Proceedings, American Society of Civil Engineers, Journal of the Hydraulics Division, Paper 8227, Vol. 97, No. HY 7, p 977-991, July 1971. 15 p, 9 fig, 2 tab, 19 ref, 2 append.

Descriptors: *Reservoir storage, *Hydrology, *Markov processes, *Stochastic processes, Water supply.
Identifiers: *Arroyo Seco.

The stochastic generation method was examined to determine what circumstances were best suited to its use and what variables were significant in its application to reservoir size and determination studies. Preliminary studies were made using the available flow records for Arroyo Seco, California to determine if any uncertainty existed using stochastic hydrology methods and, if so, where the principal areas of uncertainty were located. These studies indicated that there was uncertainty associated with parameter estimation, mathematical techniques employed and methods of using and interpreting stochastic data. These sources of uncertainty were explored by empirical sensitivity tests. Inflow traces were generated by simple Markov models; demand was treated as time variable. The relative advantages of annual and monthly models, the influence of initial reservoir contents on required storage, and errors resulting from use of insufficient inflow traces to estimate storage requirements, were shown. Required storage was described by the extreme value probability distribution. (Veverka-Cornell)
W71-10872

4B. Groundwater Management

EFFECT OF IRRIGATION ON THE SALT REGIME OF TERRACED CHERNOZEMS OF THE TRANS-VOLGA REGION (Vliyaniye orosheniya na solevoy rezhim terrasovykh Chernozemov Zavolzh'ya),
Kuybyshev Agricultural Inst. (USSR).
For primary bibliographic entry see Field 05C.
W71-10598

OGALLALA AQUIFER SYMPOSIUM,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 02F.
W71-10677

BASIN RECHARGING THE OGALLALA AQUIFER THROUGH PLEISTOCENE SEDIMENTS, TEXAS HIGH PLAINS,
Agricultural Research Service, Bushland, Tex.
V. S. Aronovici, A. D. Schneider, and O. R. Jones.
Supported by the U.S. Department of Agriculture and Texas Agricultural Experiment Station. In: Ogallala Aquifer Symposium, Texas Tech University, International Center for Arid and Semi-Arid Land Studies, Special Report No. 39, 1970, p. 182-192. 4 fig, 10 ref.

Descriptors: *Artificial recharge, *Groundwater basins, *Aquifers, *Groundwater mining, *Water management (Applied), Soil water movement, Pleistocene epoch, Natural recharge, Percolating water, Water table, Zooplankton, Sites, Operation and maintenance, Water level fluctuations, Texas, Lake beds, Recharge, Sediments, Sediment loads.
Identifiers: *Ogallala Aquifer, Texas High Plains.

Natural recharge to the extensively pumped Ogallala Aquifer is negligible. Basin recharge tests through Pleistocene sediments in the Texas High Plains were undertaken to determine the effectiveness of this method. Two 0.1-acre basins were excavated into Pleistocene pluvial sediments underlying Pullman Soil. Recharge water quality was controlled in these basin experiments. The release of entrapped air and development of macro channels in the recharging sediments produced increasing percolation rates and rising free water surface. Clogging developed as a result of sediment-laden water and zooplanktonic growth. Sealing was easily removed to reproduce pre-clogging recharge rates. The total intake was 14.9 acre-feet for 66 days. Site selection for recharge basins is most important and requires careful field exploration. The advantages of basin recharge are the low cost and ease of clogging-material removal. Additional information includes location of study area, neutron and piezometer instrumentation, recharge rate, and water-table fluctuation as influenced by basin recharge. (See also W71-10677) (Popkin-Arizona)
W71-10683

APPLICATION OF SURFACE PRESSURE TO ASSIST WATER RECHARGE INTO THE OGALLALA FORMATION,
Texas Tech Univ., Dept. of Petroleum Engineering, Lubbock.
Philip Johnson.
In: Ogallala Aquifer Symposium, Texas Tech University, International Center for Arid and Semi-Arid Land Studies, Special Report No. 39, 1970, p. 193-204, 8 fig, 2 tab.

Descriptors: *Pressure, *Artificial recharge, *Water storage, *Recharge wells, *Economic efficiency, Water management (Applied), Groundwater mining, Operation and maintenance, Sites, Cores, Test procedures, Instrumentation, Sediment, Costs, Land use, Pressure.
Identifiers: *Ogallala Formation.

Field studies were performed in west Texas to develop economical techniques of recharging the Ogallala Formation at high rates by application of pump pressure. Porous, dewatered zones in the Ogallala are ideal water-storage sites in this developing area. Sources of projected recharge water are excess rainfall and imported water. Cored and logged test wells, a 20-inch diameter, 107 foot cased and 55 foot torch perforated recharged well, and 3 observation wells were drilled, developed and instrumented. The pressure pump was a double-suction centrifugal, 2000 gallon-per-minute capacity at 100 psig and 1760 RPM, powered by a 6-cylinder, 175-HP gasoline engine. Tests from 1964 to 1966 were performed by gravity flow, where maximum injection rate was 525 gpm, and decreased to 37.5 gpm after 5 acre-feet were recharged. Pressure recharging permitted 1,920 gpm recharge rates at 85 psig with declining pressure to 55 psig after pumping 3 1/2 hours at maximum rate. A cumulated 69,920 lbs. of fine suspended particles were injected. Costs were abnormally high (fuel cost of $4.27/acre-foot) because of poor design. Projected costs of $1.94/acre-foot is reasonable. Estimated total costs to develop a recharge well capable of 1700 gpm at 50 psig is $3,969. Pressure recharge is economical, rapid, and efficient, and permits maximum utilization of land. (See also W71-10677) (Popkin-Arizona)
W71-10684

THE TEXAS WATER DEVELOPMENT BOARD COOPERATIVE STUDIES OF THE OGALLALA UNDERGROUND RESERVOIR,
For primary bibliographic entry see Field 02F.
W71-10687

THE GEOLOGICAL SURVEY AND WATER FOR SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 06B.
W71-10713

GROUNDWATER RESOURCES OF THE MORA RIVER DRAINAGE BASIN WITHIN WESTERN MORA COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
J. W. Mercer, and E. G. Lappala.
Geological Survey Open-file Report, March 1971. 141 p, 18 fig, 5 tab, 29 ref, 8 append.

Descriptors: *Groundwater, *Irrigation water, *Supplemental irrigation, *Aquifer characteristics, *New Mexico, Water wells, Pumping, Withdrawal, Water yield, Groundwater recharge, Aquifers, Transmissivity, Storage coefficient, Geology, Hydrogeology, Water resources development, Water quality.
Identifiers: *Mora County (N Mex), *Groundwater resources, Pumping tests.

Shortages of surface water for irrigation during the latter part of the growing season have limited agricultural development in western Mora County in northwestern New Mexico. This report describes the possibilities for developing groundwater for supplementary use. In nearly all of the Mora River drainage, unconsolidated deposits of alluvial, colluvial, lacustrine, and glacial origin of Quaternary contain groundwater. Thickness of these deposits range from a few feet in tributary valleys to about 300 feet in the Mora valley in western Mora County. Groundwater development is feasible in the alluvial valley near Watrous. Unconsolidated deposits in this area are relatively homogeneous and isotropic. Transmissivity values range from 3,400 to 20,000 sq ft/day, and the assumed maximum storage coefficient value is 0.2. The amount of groundwater in storage is about 4,000 acre-feet. Annual withdrawals from aquifer storage would be substantially replaced by recharge from the river and by return flow from irrigation water. The chemical quality of both surface and groundwater throughout the alluvial valleys of western Mora County meets the established criteria for irrigation use. (Woodard-USGS)
W71-10725

SELECTIVE WITHDRAWAL FROM A STRATIFIED RESERVOIR,
California Univ., Berkeley.
For primary bibliographic entry see Field 02H.
W71-10750

EVALUATION BY TEST DRILLING OF GEOPHYSICAL METHODS USED FOR GROUNDWATER DEVELOPMENT IN THE PIEDMONT AREA, ALABAMA,
Geological Survey of Alabama, University.
Gary V. Wilson, Thomas J. Joiner, and James C. Warman.
Alabama Geological Survey Circular 65, 1970. 15 p, 4 fig, 2 plate, 1 tab, 17 ref. OWWR Project B-018-ALA (1).

Descriptors: *Groundwater, *Water resources, *Water supply, *Alabama, Methodology, Geophysics, Aquifers, Aquifer characteristics, Water yield, Groundwater movement, Geology, Geomorphology, Gamma rays.
Identifiers: *Groundwater development, *Test holes, Well logs, Cleburne County (Ala), Geophysical data.

Eleven test wells were drilled in the vicinity of Heflin in Cleburne County, Alabama to evaluate the interpretations and concepts developed in earlier geophysical studies conducted in 1966 and 1967. Quantities of groundwater adequate for municipal and industrial purposes were not found. Geological interpretations based on geophysical data were proved to be essentially accurate. Well yields in the Piedmont area are more closely associated with the degree of weathering and fracturing than with inherent differences in the mineralogical makeup of the rock. Fracturing weathering, morphological stages, erosion, and the tectonic or structural history of each metamorphic or igneous rock unit may be distinct within a region. Therefore, identical rock types may produce distinctly different well yields in closely adjoining areas. Of the 11 test wells, 4 are 'dry,' 3 will yield from 5 to 10 gpm, 3 from 10 to 15 gpm, and 1 about 30 gpm. Residual soils, talus and alluvium, and saprolite zones can be mapped by geological and geophysical methods. These materials act a temporary reservoir that absorb rainfall and release it to underlying fracture systems where such systems exist. The search for groundwater by geophysical and geological methods is made difficult by soil and vegetation cover, topographic conditions, and extreme variations of lithology and structure. (Woodard-USGS)
W71-10806

BASIC CONSIDERATIONS OF WELL DESIGN,
Bureau of Reclamation, Denver, Colo. Div. of Drainage and Groundwater Engineering.
Tom Ahrens.
Water Well Journal, Vol 24, No 4, p 45-50, April 1970. 6 p, 12 ref.

Descriptors: *Water wells, *Drill holes, *Well regulations, *Drilling equipment, Methodology, Logging (Recording), Well screens, Well casings, Well filters, Hydrogeology, Aquifers.
Identifiers: *Drilling specifications, *Well hydraulics.

The operations and designs entering into various parts of a water well and the applicable theories and hypotheses are described under the following topics: (1) Best methods for pilot holes; (2) cable tool best for pilots; (3) logs and analyses determine screen; (4) drilling specifications; (5) principles of well hydraulics; (6) applications of well hydraulics; and (7) make-up of the contractor. Wells are becoming larger, deeper, and more complex as more knowledge is gained on the occurrence of groundwater and the design and construction of wells. As a consequence, more care must be exercised in weighing the ability and equipment capabilities of a contractor to assure that they are adequate for the job. (Woodard-USGS)
W71-10815

SYSTEMS ANALYSIS FOR GROUNDWATER MANAGEMENT, PHASE II,
California Univ., Berkeley. Dept. of Civil Engineering.
David K. Todd.
Technical Information Service as PB-201 969, $3.00 in paper copy, $0.95 in microfiche. Water Resources Center, UCAL-WRC-W-155, Apr 1971. 10 p, 3 ref. OWRR Project B-041-CAL (4).

Descriptors: *Groundwater, *Systems analysis, *Tidal effects, Saline water intrusion, Mathematical models, Aquifer characteristics, Recharge.

The intrusion and dispersion of the fresh-salt water interface in coastal aquifers were treated both as a hydrologic phenomenon and as a dispersion phenomenon by tidal fluctuation near the coastline. The study was conducted in parts: (1) Equations were developed describing the spatial variation of the interface for various flow regimes encountered in an aquifer from a recharge to overdraft condition; (2) Relationships were presented to determine the longitudinal and transverse dispersion coefficients using the properties of the flow and porous medium; (3) A finite element solution was described to predict the distribution of concentration for a given set of the velocity field in a two-dimensional aquifer and the two dispersion coefficients; and (4) In a hypothetical aquifer with given flow conditions, the distance of intrusion of a sharp interface was graphically represented. The rate of increase of the transition zone was presented for the given seasonal variation of flow and the tidal fluctuations. A generalized mathematical model describing a two-dimensional aquifer system with a transition zone caused by the tidal oscillations and by the secular variation of flow was presented. (Veverka-Cornell)
W71-10850

OPTIMUM PUMPING CONDITIONS FOR WELLS LOCATED IN UNCONFINED COASTAL AQUIFERS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs.
Journal of Hydrology, Vol. XIII, No. 1, p 63-69, April 1971. 7 p, 6 fig, 2 ref, 1 append.

Descriptors: *Pumping, *Wells, *Aquifers, *Coastal structures, Optimization, Seepage, Rainfall.

The pumping rate of fresh water from a well in a coastal aquifer was shown to have a maximum value which might be calculated from an analysis of the horizontal seepage. In particular, this rate was greatest when the well was sunk just to sea level. As examples, the maximum pumping rates from wells located in the Ghyben-Herzberg lens of fresh water formed by rainfall on a circular island and in an aquifer between a fresh water reservoir and the sea, were calculated. (Veverka-Cornell)
W71-10876

WATER WELL DRILLERS ACT.
For primary bibliographic entry see Field 06E.
W71-10938

4C. Effects on Water of Man's Non-Water Activities

COMPUTED FLOOD PROFILE-RIVER DES PERES, GROBY STREET TO 82nd

BOULEVARD, UNIVERSITY CITY, ST. LOUIS COUNTY, MISSOURI,
Geological Survey, St. Louis, Mo.
For primary bibliographic entry see Field 02E.
W71-10572

A PROCEDURE FOR EVALUATING ENVIRONMENTAL IMPACT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06G.
W71-10688

GENERALIZED FLOOD-FREQUENCY ESTIMATES FOR URBAN AREAS IN MISSOURI,
Geological Survey, Rolla, Mo.
E. E. Gann.
Geological Survey Open-file Report, 1971. 18 p, 3 fig, 1 tab, 10 ref.

Descriptors: *Flood forecasting, *Urbanization, *Environmental effects, *Floods, *Missouri, Planning, Cities, Construction, Streamflow, Peak discharge, Runoff, Flood control, Hydrologic data, Mathematical studies, Regression analysis.
Identifiers: *Urban hydrology (Mo).

A method is presented for estimating flood-frequency information for urban areas in Missouri. Flood-frequency relations are presented which provide an estimate of the flood-peak discharge for floods with recurrence intervals from 2.33 to 100 years for basins with various degrees of existing or projected urban development. Drainage area sizes for which the relations are applicable range from 0.1 to 50 square miles. These generalized relations will be useful to the urban planner and designer until more comprehensive studies are completed for the individual urban areas within the State. The relations will also be of use in the definition of flood-hazard areas in Missouri. (Woodard-USGS)
W71-10714

THE MICROCLIMATE IN CARLSBAD CAVERNS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
J. S. McLean.
Geological Survey Open-file Report, May 1971. 67 p, 19 fig, 3 tab, 9 ref.

Descriptors: *Karst, *Caves, *Evaporation, *Drying, *New Mexico, Water loss, Air circulation, Water balance, Climatology, Humidity, Air temperature, Heat flow, Monitoring, Data collections.
Identifiers: *Carlsbad Caverns (NM), *Cave climate.

Many pools in Carlsbad Caverns have been drying up in the recent past. To determine the cause of the drying, evaporation, relative humidity, temperature, carbon dioxide content of the air, air flow, and water levels in pools were monitored. Evaporation varied from 0.10 to 2.10 centimeters per month and averaged about 2% of the evaporation of the surface. Relative humidity averaged about 69% in Devil's Den and 86% in the Lunch Room. Temperature ranges from 10.8 deg C below the Natural Entrance to 19.6 deg C at Lake of the Clouds. Most of the cave is colder than the mean annual surface temperature of 17 deg C. The air temperature varied from 10.6 to 19.6 deg C at Devil's Den and from 12.8 to 14.3 deg C at the Lunch Room. The carbon dioxide content of the air in the Lunch Room varied from 342 to 490 parts per million. Water levels in some pools remained almost constant, while others declined as much as 9 centimeters. The primary cause of drying is uncontrolled air flow up the elevator shaft, which exhausts more than 22,000 gallons of water per year. The heat added to the cave by the lighting system is a secondary cause of drying. (Knapp-USGS)
W71-10731

LET'S CONSIDER OUR ENVIRONMENT.
Indiana Dept. of Commerce, Indianapolis. Div. of Planning.
For primary bibliographic entry see Field 06G.
W71-10782

URBAN RIVERSIDE ENVIRONMENTAL ANALYSIS,
Harland Bartholomew and Associates, Memphis, Tenn.
For primary bibliographic entry see Field 06G.
W71-10882

THE IMPACT OF URBANIZATION ON WATERSHED DEVELOPMENT,
Soil Conservation Service, Harrisburg, Pa.
Thomas A. Dumper.
Journal of Soil and Water Conservation, Vol 21, No 1, p 24-26, January-February 1966, 4 fig.

Descriptors: *Watershed management, *Urbanization, *Land use, *Planning, Flood plains, Erosion.
Identifiers: *Watershed development.

A shift in land use from agriculture to urban development not only creates problems for community planners but presents an equally challenging problem to watershed planners, especially in an area prone to flooding. In this article the author explains why possible future land use changes must be considered in planning a watershed project. (Strachan-Chicago)
W71-10891

4D. Watershed Protection

APPLICATION OF ENVIRONMENT ANALYSIS TO WATERSHED SNOWMELT,
Agricultural Research Service, Burlington, Vt., New England Watershed Research Center; and Vermont Univ., Burlington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02C.
W71-10462

GENERALIZED ANALYSIS OF SMALL WATERSHED RESPONSES,
California Univ., Davis. Dept. of Water Science and Engineering.
Alban Brandstetter, and Jaime Amorocho.
Water Science and Engineering Paper no. 1035, Department of Water Science and Engineering, University of California, Davis, June 1970. 204 p, 47 fig, 26 tab, 33 ref, 5 append. OWRR Project B-055-CAL (10).

Descriptors: *Watershed management, *Rainfall-runoff relationships, *Input-output analysis.

This study presented a numerical solution for the functional series representation of nonlinear, time invariant, lumped parameter physical systems based on orthogonal expansions of the unknown system response functions by Meixner functions. The expansions permitted the determination of the linear and nonlinear response functions from concurrent sequences of the systems inputs and outputs by solving a set of equations which were linear with respect to the Meixner coefficients of the response functions. The main objective was to develop adequate analytical relationships between rainfall and runoff in small watersheds which were tested with synthetic systems, with synthetic 'rainfall' and 'runoff' data from a laboratory catchment, and with real rainfall and runoff data from a natural watershed. Linear and second order response functions were computed for the laboratory catchment and for the natural watershed. The predictions of discharge for both of these physical systems were quite good on the average. Larger errors occured, however, in individual values, particularly during periods of rapidly increasing or decreasing discharge. For the natural watershed, an overestimation of the discharge values produced by some low intensity rain storms following dry periods was observed. (Veverka-Cornell)
W71-10877

THE IMPACT OF URBANIZATION ON WATERSHED DEVELOPMENT,
Soil Conservation Service, Harrisburg, Pa.
For primary bibliographic entry see Field 04C.
W71-10891

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

USE OF SPINNER CULTURE CELLS TO DETECT WATER POLLUTION,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
M. F. Li, and Carol Jordan.
Journal of the Fisheries Research Board of Canada, Vol 26, No 5, p 1378-1382, 1969. 4 fig, 2 tab, 11 ref.

Descriptors: *DDT, *2-4-D, *Chlorinated hydrocarbon pesticides, *Organophosphorous pesticides, *Growth rates, *Bioassay, *Bioindicators, *Water pollution effects, *Test procedures, Herbicides, Insecticides, Pesticides, Cultures, Inhibition, Environmental effects, Analytical techniques, Evaluation, Methodology, Quality control, Testing, Pesticide toxicity.
Identifiers: *Malathion, *Lindane, Monitoring, Cell culture, Cell counts, Spinner culture.

The sensitivity of mouse fibroblast L-cells in spinner culture to several pesticides (malathion, DDT, lindane) and a herbicide (2,4-D ester) was determined. The inhibition of L-cell growth was marked, and in the case of DDT was strictly concentration-dependent. The simplicity of reproducibility of the assay system should make it a useful tool in water pollution studies. (LeGore - Washington)
W71-10539

MAINTAINING WATER QUALITY,
National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 05C.
W71-10550

I. MEASUREMENTS OF POLLUTION EFFECTS ON LIVING ORGANISMS - BIOASSAYS TO DETERMINE ALLOWABLE WASTE CONCENTRATIONS IN THE AQUATIC ENVIRONMENT,
Federal Water Quality Administration, West Kingston, National Marine Water Quality Lab., West Kingston, R.I.
C. M. Tarzwell.
Proceedings of the Royal Society of London B, Vol 177, p 279-285, 1971. 11 ref.

Descriptors: *Bioassay, *Laboratory tests, *Test procedures, *Water pollution effects, *Bioindicators, *Pollutant identification, *Standards, *Reviews, Fish physiology, Toxins, Toxicity, Poisons, Analytical techniques, Laboratory animals, Lethal limit, Environmental sanitation, Pollutants, Water pollution, Water quality, Physiological ecology, Environmental effects, Regulation, Management, Water policy.
Identifiers: *Standard methods, Methods, Chronic pollution, Acute effects.

Although bioassays have been used for many years, the need exists for development of more effective and efficient methods which lend themselves to standardization, thereby permitting comparison of

results. The development is briefly reviewed of both short and long-term bioassays and of the attempts at standardization. The importance of long-term bioassays is stressed, as data delineating concentrations of potential toxicants which are not harmful to the aquatic biota with continuous exposure are essential for setting water quality standards. Several suggestions and observations are advanced relative to future developments. (LeGore-Washington)
W71-10551

ASSESSMENT OF POLLUTION EFFECTS BY THE USE OF ALGAE,
Liverpool Univ. (England). Hartley Botanical Labs.
Elsie M. Burrows.
Proceedings of the Royal Society of London B, Vol 177, p 295-306, 1971. 5 fig, 22 ref.

Descriptors: *Pollutant identification, *Bioassay, *Indicators, *water pollution effects, *Algae, *Marine algae, *Bioindicators, *Photosynthesis, *Plant physiology, Pollutants, Analytical techniques, Water pollution sources, Toxins, Wastes, Chlorophyta, Sessile algae, Water analysis.
Identifiers: *Laminaria sp., *Ulva sp., Macrocystis sp.

An attempt was made to use the growth rate in culture of some of the larger attached algae for indication of pollution. Ulva lactua has a high potential from this point of view because of the ease with which it can be cultured and also because of its reactions to pollution by sewage. The growth rate of Laminaria saccharina shows a graded response to changes in total medium and physical conditions and to concentrations of added single substances. This species could be a useful pollution indicator, not only because of its sensitivity to changes, but also because of the part it plays in the ecosystems of the British coasts. (LeGore-Washington)
W71-10553

TOXICITY TO FISH OF TWO ORGANIC REACTOR COOLANTS,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment; and Atomic Energy of Canada Ltd., Pinawa (Manitoba). Environmental Control, Health and Safety Branch.
For primary bibliographic entry see Field 05C.
W71-10555

PRELIMINARY STUDIES ON THE TOLERANCE OF AQUATIC INSECTS TO LOW PH,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 05C.
W71-10559

USE OF FISH BRAIN ACETYLCHOLINESTERASE TO MONITOR POLLUTION BY ORGANOPHOSPHOROUS PESTICIDES,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Biological Lab.
For primary bibliographic entry see Field 05C.
W71-10560

AN AIR-ECONOMIZER APPARATUS FOR USE IN FISH WORK,
Water Pollution Research Lab., Stevenage (England).
F. S. H. Abram.
Journal of Fisheries Biology, Vol 3, p 203-205, 1971. 2 fig, 1 ref.

Descriptors: *Equipment, *Fish handling facilities, Laboratory equipment, Research equipment, Bioassay, On-site laboratories, On-site investigations, On-site tests, Instrumentation, Quality control.
Identifiers: *Air supply, *Remote laboratories.

Cylinders of compressed air are usually employed to aerate fish stock tanks located distant from sources of main electricity. The apparatus described drives a compressor by extracting some of the energy contained within the high-pressure air from the cylinder by expanding it through an engine, and recovering the power produced. The compressor draws air from the atmosphere to supply a reservoir used to aerate the tanks, at about 0.2 atmospheres. The volume of air obtained is five to six times that available when an air cylinder is connected directly to the aeration system. (LeGore-Washington)
W71-10563

FISH SPECIES DIVERSITY INDICES AS INDICATORS OF POLLUTION IN GALVESTON BAY, TEXAS,
North Carolina State Univ., Raliegh. Dept. of Zoology.
Timothy J. Bechtel, and B. J. Copeland.
Contributions in Marine Science, Vol 15, p 103-132, 1970. 8 fig, 10 tab, 41 ref.

Descriptors: *Water pollution effects, *Bioindicators, *Texas, *Biological communities, *Ecological distribution, Water pollution sources, On-site data collections, On-site investigations, Analytical techniques, Water quality, Industrial wastes, Effects, Water pollution, Dominant organisms, Ecotypes, Environmental gradient, Habitats, Niches, Environmental effects, Physiological ecology, Estuarine environment, Estuarine fisheries.
Identifiers: *Species diversity, Galveston Bay (Texas).

Fish species diversity indices calculated from trawl collections were useful indicators of environmental stress in Galveston Bay, Texas. Diversity values ranged from 2.2 in the Texas City-Galveston area to 0.02 in the Houston Ship Channel. Thus it is demonstrated that the concept of using species diversity to indicate adverse water quality conditions is applicable to the higher trophic levels of an estuary. Significant areal and seasonal differences were detected. It was also indicated that both biomass and numbers of organisms should be utilized when studying the diversity of higher trophic levels. Those areas receiving the greatest amounts of effluents and toxic materials (up to 86% effluent by volume) exhibited the lowest mean annual diversities. Fish populations could be divided into somewhat separate communities, each structured as a response to environmental and pollution stress. In those areas receiving the greatest stress, the bay anchovy, Anchoa mitchilli, was the dominant species. These areas also supported the fewest numbers of large individuals. (LeGore-Washington)
W71-10564

SALTON SEA, CALIFORNIA--WATER QUALITY AND ECOLOGICAL MANAGEMENT CONSIDERATIONS,
Federal Water Quality Administration, San Francisco, Calif. Pacific Southwest Region.
For primary bibliographic entry see Field 05G.
W71-10577

SOME ASPECTS OF THE PHENOL-HYPOCHLORITE REACTION AS APPLIED TO AMMONIA ANALYSIS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 02K.
W71-10579

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1970,
Naval Ship Systems Command, Washington, D.C. Nuclear Power Directorate.
M. E. Miles, J. J. Mangeno, and R. D. Burke.
Available from Supt. of Documents, U.S. Govt. Printing Office, Washington, D.C. 20402. $0.50 per copy. Radiological Health Data and Reports, Vol 12, No 5, p 235-244, May 1971, 6 tab, 20 ref.

Descriptors: *Ships, *Radioactive Waste Disposal, *Water pollution sources, *Water pollution effects, Water pollution control, Monitoring, Oceans, Harbors, Naval architecture, Nuclear energy, Measurement discharge, Regulation, Radiation, Sediments, Cobalt.
Identifiers: US Navy, Nuclear powered ships, Shipyards, Piers, Radiation safety and control.

Data are summarized on disposal of radioactive wastes from U.S. Naval nuclear-powered ships and their support facilities and results are summarized of environmental monitoring performed to confirm adequacy of waste disposal limits and procedures. The total radioactivity discharged into all ports and harbors was 0.024 curies in 1970, less than one hundredth the total annual discharges of the early 1960's. Results of environmental surveys of harbor water and bottom sediment for gross radioactivity and for cobalt-60 show that (1) no increase in radioactivity above normal background levels has been detected in harbor water, (2) discharges of liquid wastes from U.S. Naval nuclear-powered ships have not caused a measurable increase in the general background radioactivity of the environment, and (3)low-level cobalt-60 radioactivity is detectable in localized areas of harbor bottom sediment around a few piers at operating bases and shipyards where maintenance and overhaul of Naval nuclear-powered ships have been conducted over a period of several years; these levels have decreased in recent years. (Houser-NSIC)
W71-10634

THE EFFECTS OF EXTREME FLOODS AND PLACER MINING ON THE BASIC PRODUCTIVITY OF SUB-ARTIC STREAMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W71-10648

SAMPLING OF GLACIAL SNOW FOR PESTICIDE ANALYSIS,
Vermont Univ., Burlington.
Thomas R. Stengle, James J. Lichtenberg, and Charles S. Houston.
February 13, 1971, 16p, 2 tab, 2 ref. EPA-WQO Program 16020-GAG.

Descriptors: *Pesticides, *Snow, DDT, *SAMPLING, *Pollutant identification, Analytical techniques, Water pollution sources.
Identifiers: *Polychlorinated biphyenyls, Glacial snow, Mt. Logan, Yukon Territory, Canada, Atmospheric transport.

This project was intended to demonstrate the feasibility of taking snow samples from high altitude snowfields for pesticide analysis, and to develop sampling techniques which would avoid contamination. The sampling was to be carried out in the field, under adverse conditions, with minimal equipment. Coincidentally, the DDT level in the sampling site could be determined. The sampling was done on the plateau glacier (elevation 17,500 ft.) of Mt. Logan, Y.T., Canada. The area is remote, and the sampling team had to contend with storms, low temperatures, and the effects of high altitude. Simple techniques for obtaining samples and shipping them to the laboratory were tested. Samples were taken to a depth of 15 meters to determine whether DDT concentration varied with the age of the snow. Analysis showed no DDT within the limit of detectability. However, over half the samples were contaminated with PCB's which raised the detectability limit to 10-50 ng/l. The limit was 5 ng/l for the uncontaminated samples. The PCG contamination is believed to have come from the sampling auger; it is recommended that more attention be paid to precleaning sampling equipment in future work. (Ballinger-EPA)
W71-10675

HOW TO MEASURE THE ISOTHERMAL COMPRESSIBILITY OF LIQUIDS ACCURATELY,
National Engineering Lab., East Kilbridge (Scotland).
For primary bibliographic entry see Field 01A.
W71-10689

A REVIEW OF THE 1970 LITERATURE ON WASTE WATER AND WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 05G.
W71-10691

ROUTINE ANALYTICAL METHODS,
A. Williams.
Journal Water Pollution Control Federation, Vol 43, No 6, p 933-937, Jun 1971. 5 p, 7 ref.

Descriptors: *Waste water (Pollution), *Water analysis, *Monitoring, *Reviews, Water quality control, Analytical techniques, Chemical analysis, Water pollution control, Laboratory tests, Bibliographies.
Identifiers: Waste water analysis.

Many procedures used in water control testing which may also be used in routine testing of waste water are reviewed. The research literature describes methods that have not been adapted for ordinary routine testing because of the high cost of instruments and the need for skilled laboratory personnel. Some of the preferred analytical techniques and procedures used in water quality monitoring are very useful in waste water analysis. (See also W71-10691) (Knapp-USGS)
W71-10692

AUTOMATED AND MONITORING TECHNIQUES,
L. E. Doughty.
Journal Water Pollution Control Federation, Vol 43, No 6, p 937-942, Jun 1971. 6 p, 40 ref.

Descriptors: *Pollutant identification, *Monitoring, *Automation, *Chemical analysis, Chlorides, Sulfates, Dissolved oxygen, Analytical techniques, Polarographic analysis, Photometry, Radiochemical analysis, Bibliographies.
Identifiers: Radiochemistry.

Automated chemical analyses and monitoring techniques used in wastewater processing are reviewed. The methods include potentiometric determination of chlorides, automatic control of DO in wastewater, hydrogen sulfide determination, polarography, conductivity, COD monitoring, turbidity measurement, hardness control, and radiochemical techniques. (See also W71-10691) (Knapp-USGS)
W71-10693

TRACE METALS: UNKNOWN, UNSEEN POLLUTION THREAT.
For primary bibliographic entry see Field 05B.
W71-10705

PRELIMINARY EVALUATION OF CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Geological Survey, Tallahassee, Fla.
D. A. Goolsby, and B. F. McPherson.
Geological Survey Open-file Report (No 71001), 1970. 73 p, 5 fig, 6 tab.

Descriptors: *Water quality, *Lakes, *Florida, Thermocline, Epilimnion, *Aquatic environment, Limnology, Phytoplankton, Zooplankton, Aquatic microorganisms, Aquatic plants, Nannoplankton, Nekton, Water pollution sources, Hypolimnion, Oxygen demand, Biological properties, Water temperature, Chemical oxygen demand, Dissolved oxygen, Water pollution, Pollutant identification.
Identifiers: *St. Johns River (Fla), *Econlockhatchee River (Fla), *Lakes (Central Florida).

An investigation was conducted into both the chemical and biological characteristics of the upper St. Johns River basin in central Florida. The specific areas studied were the St. Johns River, Econlockhatchee River, Blue Cypress Lake, Lake Hellen Blazes, Sawgrass Lake, Lake Washington, Lake Winder, Lake Poinsett, Puzzle Lake, and Lake Harney. The phytoplankton and zooplankton populations present, as well as some pollution due to insecticides, is discussed in detail. Dissolved solids, dissolved oxygen, and organic nitrogen were determined. (Glasby-USGS)
W71-10736

DETERMINATION OF MINOR ELEMENTS IN WATER BY EMISSION SPECTROSCOPY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W71-10807

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1970,
Naval Ship Systems Command, Washington, D.C., Nuclear Power Directorate.
For primary bibliographic entry see Field 05B.
W71-10809

CHLORINATED HYDROCARBON PESTICIDES IN IOWA RIVERS,
Iowa Univ., Iowa City. State Hygienic Lab.
Lauren G. Johnson, and Robert L. Morris.
Pesticides Monitoring Journal, Vol 4, No 4, p 216-219, Mar 1971. 4 p, 4 tab, 9 ref.

Descriptors: *Iowa, *Rivers, *Chlorinated hydrocarbon pesticides, *Pesticides, Water pollution sources, Water quality, Surface runoff, River flow, Water pollution, Pesticide residues, Vegetation effects, Cultivated lands, Crops, Insects, Organic pesticides, Agricultural chemicals, Bactericides, Fungicides, Sprays, DDT, Aldrin, Dieldrin.
Identifiers: *Iowa River (Iowa), *Marengo (Iowa).

The routine monitoring of a number of Iowa rivers for chlorinated hydrocarbon pesticides over a 3-year period has shown the presence of dieldrin, DDT, or DDE in the majority of the samples taken. Dieldrin has occurred more frequently and in higher concentrations than either of the other residues, and this is attributed to the amount of agricultural activity in the watersheds involved and to the amount of surface water runoff. (Glasby-USGS)
W71-10810

MEDITERRANEAN POLLUTION--ANOTHER YEAR OF NEGLECT,
For primary bibliographic entry see Field 05B.
W71-10816

A STUDY OF BIOLOGICAL COMMUNITIES IN THE SCIOTO RIVER AS INDICES OF WATER QUALITY,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 05C.
W71-10898

THE TRACE FLUOROMETRIC DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN NATURAL WATER,
New Hampshire Univ., Durham. Dept. of Chemistry.
Richard Edward Keegan.
Ph D Thesis, May 1971. 144 p, 42 fig, 20 tab, 122 ref. OWRR Project A-009-NH (2).

Descriptors: *Chromatography, *Water analysis, *Organic compounds, *Aromatic compounds, *Pollutant identification, Fluorometry, Instrumentation.
Identifiers: Polynuclear aromatic hydrocarbons.

A procedure was developed for the determination of polynuclear aromatic hydrocarbons (PNA) present in natural water in concentrations of parts per trillion. The PNA are removed from the water by extraction with n-pentane. Interfering basic compounds are removed by extraction with 72% H2SO4. Separation of the individual PNA is carried out on a thin-layer chromatography sheet. The developed chromatogram is analyzed fluorometrically. Qualitative analysis is based primarily upon migration distance of a compound relative to that of a benzo (a)pyrene standard and fluorescence spectra obtained directly from the TLC sheet. Water samples from three New Hampshire rivers were analyzed using this method. Tof of these rivers contained traces of PNA ranging from 80 to 1000 ppm. Four PNA identified are dibenz (a,h) anthracene, benzo (a) pyrene, benzo (b) fluorene, and fluoranthene. Analysis of the data suggests that the PNA are naturally occurring. Samples taken from a relatively unpolluted river showed the greatest number and largest quantities of PNA. (Knapp-USGS)
W71-10914

5B. Sources of Pollution

THE GROWTH OF OIL SLICKS AND THEIR CONTROL BY SURFACE CHEMICAL AGENTS,
Shell pipe Line Corp., Houston, Tex.
For primary bibliographic entry see Field 05G.
W71-10451

WIND TUNNEL EXPERIMENTS ON OIL SLICK TRANSPORT,
Naval Civil Engineering Lab., Port Hueneme, Calif.
J. A. O'Brien.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 2, p 197-215, 1971. 19 p, 4 fig, 5 tab, 7 ref.

Descriptors: *Model studies, *Oily waters, *Path of pollutants, *Winds, Currents (Water), Wind velocity, Wind pressure, Water circulation, Movement, Translocation, Hydraulic models.
Identifiers: *Oil spills, *Oil slicks, Wind tunnels.

Thin oil slicks on water are transported by wind at rates which are independent of oil density and viscosity, and in fact that oil slick velocities are the same as surface velocities of clean water. Using a wind tunnel model, a characteristic Reynolds Number of the water was correlated with the ratio of oil slick velocity to wind velocity. For every situation likely to occur at sea, the Reynolds Number is sufficiently large such that the dependence is not important and it may be assumed that the oil slick velocity is a fixed percentage of the wind velocity. Both laboratory and field data support the estimate of 3.3 percent for the ratio of oil slick velocity to wind velocity. Wind tunnel work indicates that thick slicks travel more slowly. However, the wind has a thinning effect on oil slicks and very quickly reduces the thickness to a value such that transport occurs at the same rate as would occur on water surface. (Knapp-USGS)
W71-10472

THE FRAGIPAN MENACE AND COMPREHENSIVE PLANNING IN MEGALOPOLIS,
Soil Conservation Service, Washington, D.C.
George D. Bailey.
Proceedings of the Association of American Geographers, Vol 3, p 25-28, 1971. 7 ref.

Descriptors: *City planning, *Urbanization, *Community development, Planning, Water pollution, Public health, Septic tanks.

Identifiers: *Fragipan, *Comprehensive planning, *Megalopolis.

Fragipans, dense subsurface soil horizons of low permeability, are distributed through Megalopolis, with a heavy concentration in New York and New England. Seasonal perched water tables, caused by the low permeability, the high precipitation rates of the region, and the low evapotranspiration rates of winter and spring affect the use of these soils. Agricultural land use is affected by fragipans, and its influence is reflected in specific soil management procedures. Urban development on fragipan soils results in numerous community problems, the most serious being health hazards from malfunctioning septic tank sewer systems. Comprehensive planning can provide solutions to soil related problems of development but only when the tools are available for both inventory and interpretation of basic soil data. (Davis - Chicago)
W71-10510

MICROBIAL ECOSYSTEM STRESS INDUCED BY AN ORGANOPHOSPHATE INSECTICIDE,
Massachusetts Univ., Amherst. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 05C.
W71-10545

TOXICITY TO FISH OF TWO ORGANIC REACTOR COOLANTS,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment; and Atomic Energy of Canada Ltd., Pinawa (Manitob.). Environmental Control, Health and Safety Branch.
For primary bibliographic entry see Field 05C.
W71-10555

A SURVEY OF SOME PHYSIOLOGICAL CHARACTERISTICS OF STREAM-BORNE BACTERIA,
Birmingham Univ. (England). Dept. of Microbiology.
J. W. Hopton.
Water Research, Vol 4, No 7, p 493-499, July 1970. 7 p, 3 tab, 16 ref.

Descriptors: *Water pollution sources, *Bacteria, *Surface waters, *Coliforms, *Water analysis, Water chemistry, Biochemistry, Microorganisms, Analytical techniques, Sampling, Ecology, Aquatic microorganisms, Aquatic bacteria.

Some physiological properties of heterotrophic bacteria isolated from a stream over a 2-yr period have been surveyed. Most of the organisms exhibited oxidative catabolic properties and did not exhibit exacting nutritional requirements. Attempts to assess growth rate at different temperatures had limited success but the evidence indicated that psychrophilic properties were common. The bacterial population of the stream collectively exhibits versatile and adaptable metabolic properties. (Woodard-USGS)
W71-10578

BIOLOGY OF CLADOPHORA IN FRESHWATERS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W71-10580

TRITIUM MOVEMENT IN A TROPICAL ECOSYSTEM,
Argonne National Lab., Ill.
C. F. Jordan, J. J. Koranda, J. R. Kline, and J. R. Martin.
Bioscience, Vol 20, No 14, p 807-812, July 15, 1970. 6 fig, 1 tab, 16 ref.

Descriptors: *Tritium, *Ecosystems, *Tropical regions, Soil-water-plant relationships, Soil water movement.

The portion of the pulse of water moving on through the subsoil maintains a near-symmetrical distribution, and the movement of tritium through the soil is the rate-limiting step in the movement of tritium through soil and air. Since the situation of relatively porous soil overlying denser parent material is common throughout the world, it appears that the model of tritium movement presented is of general applicability, though the ratio of tritium that moves downward through the subsoil to that which drains laterally would vary from site to site. (Bopp-NSIC)
W71-10602

STUDY OF THE DISPERSION OF RADIOACTIVE EFFLUENTS INTO A LAKE - CONTAMINATION OF THE BOTTOM SEDIMENTS,
European Atomic Energy Community, Ispra (Italy). Protection Service.
M. de Bortoli, and P. Gaglione.
Minerva Fisiconucleare, Vol 14 (4), p 190-196, 1970.

Descriptors: *Survey, *Radioactivity, *Lake, *Sedimentation, Measurement, Spectrometers, Effluents, Water pollution, Water pollution sources, Radioisotopes, Cesium, Cobalt.
Identifiers: Lake Maggiore, Italy.

A gamma spectrometry survey has been carried out in a bay of lake Maggiore (Northern Italy) with the aim of evaluating the amount and distribution of the contamination in the bottom sediments. This contamination is due to the release of radioactive effluents (almost entirely 60Co and 137Cs) from the Euratom Ispra Establishment via a brook (Novellino), which ends into the bay. The field measurements have been confirmed and completed by gamma spectrometry analyses performed in the laboratory on sediment samples from the brook and the bay. Through these measurements the vertical profile of the contamination has been also determined and found very irregular. The contamination in the bay is confined to an area of approximately 0.03 sq Km and the activity levels found are very low, as expected on the basis of the activity released. The mean 60Co concentration, which has been discharged in amounts about 5 times higher than 137Cs, is 0.5 pCi/g of dry matter in the most highly contaminated layer, i.e. that from 0 to 7.5 cm. The total deposit of 60Co per area unit is about 78 mCi/sq Km and the associated contact dose-rate is approximately 1.4 micro rad/h. (Houser-NSIC)
W71-10603

METROPOLITAN SITING OF NUCLEAR POWER PLANTS,
Consolidated Edison Co., New York.
For primary bibliographic entry see Field 05E.
W71-10605

EFFLUENT CONTROL FOR BOILING WATER REACTORS,
General Electric Co., San Jose, Calif.
C. E. Kent, S. Levy, and J. M. Smith.
Availability: Unipub, Inc., P.O. Box 433, New York, N.Y. 10016. Proceedings of IAEA SM-146-21, Aug. 1970, p 339-357, 8 tab, 5 fig.

Descriptors: *Effluents, *Control, *Nuclear power plants, *Nuclear reactors, *Nuclear wastes, Environment, Monitoring, Safety, Design, Operations, Discharge (Water), Streams, Oceans, River, Lakes, Ponds, Tritium, Radioisotopes, Standards, Regulation.
Identifiers: Boiling water reactors, Noble gases.

Over a decade of operating experience is now available from commercial Boiling Water Reactor nuclear power plants. Experience with existing plants of releases of radioactive materials to the environment has indicated a high degree of compliance with a conservative design objective. In consequence, off-plant radiation doses have been very small compared to permissible or natural background dose. The plant design objective is to process and recycle waste streams so as to minimize both volume and radioactivity of effluents wherever practical. Releases to environs are controlled by batch processing and/or continuous monitoring before release so as to assure that no unplanned emission will occur. Monitoring in the environs of BWR facilities is performed as an audit on effluent controls and to provide data from which dose to the general public may be determined. Development is continuing on systems and on operating methods to provide assurance for new larger plants, that the dose to the public is insignificant compared to both natural background and permissible dose. Our efforts are on the basis of a firm belief that the use of nuclear energy to generate required electrical power is in the real interest of improving the environment and public health. Equipment and plant designs discussed are those supplied by the Nuclear Energy Division of the General Electric Company. (Houser-NSIC)
W71-10608

ENVIRONMENTAL CONTROL AT NUCLEAR POWER STATIONS (French: SURVEILLANCE DE L'ENVIRONNEMENT DES CENTRALES NUCLEAIRES),
Service Central de Protection Contre les Rayonnements Ionisants, Le Vesinet (France).
P. Pellerin.
Availability: Unipub, Inc., P.O. Box 433, New York, N.Y. 10016. Proceedings IAEA SM-146-24, August 1970, p 387-99, 2 fig.

Descriptors: *Environment, *Control, *Safety, *Nuclear power plants, Sites, Monitoring, Geology, Ecology, Effluents, Discharge measurement, Air pollution, Water pollution, Food chains, Path of pollutants, Population, Evaluation.
Identifiers: Radiation Safety and Control, Siting.

Environmental control at nuclear stations is effected in several stages. Prior to the installation of a particular type of reactor a very thorough study of the site must first of all be made, taking into account geology and ecological data. When the installation is complete routine monitoring should be carried out on all types of effluent at their point of discharge to the environment and at the same time on the different components of that environment (air, water, food chain, etc.). If necessary critical groups in the local population should be identified and the path of any critical radionuclides established. Finally, the overall picture thus obtained should be used for a periodical reevaluation of the situation with a view to making any necessary changes. Such evaluation must include a study of the possible consequences of nuclear incidents and accidents. Close co-operation between operators and the competent public health authorities is desirable in order to facilitate the application of control, but in all cases the public health authorities are responsible for making decisions on monitoring programs, their method of application and the interpretation of the results. (Houser-NSIC)
W71-10609

ENVIRONMENTAL BEHAVIOUR OF DISCHARGED RADIOACTIVE EFFLUENTS AT TARAPUR ATOMIC POWER STATION,
Bhabha Atomic Research Centre, Bombay (India).
P. R. Kamath, I. S. Bhat, and A. K. Ganguly.
Availability: Unipub, Inc. P. O. Box 433 New York, N. Y. 10016 Proceedings of IAEA SM-146-58, pages 475-494.

Descriptors: *Environment, *Air pollution, *Water pollution, *Control, *Nuclear power plants, Water pollution sources, Cooling water, Thermal pollution, Soil contamination, Effluents, Radioactivity, Oceans, Dispersion, Waste disposal, Sedimentation, Deposition (Sediment), Iodine radioisotopes.
Identifiers: India.

Condenser cooling sea waters from the coastal atomic power station (400 MW (e): BWR) at Tarapur (19 deg 54 ft N and 72 deg 41 ft E) are released to the sea at the shoreline through a double discharge system of canals. Gaseous and airborne effluents are discharged through a 113 m stack after appropriate filtration. Radioactive waste from clean-up systems are released to the sea with the secondary coolant discharge. The design takes into consideration possible dispersion of hot (thermal) effluents by the semi-diurnal tidal transport. Sea water discharged through the North Discharge Canal at high tide, moves north with the tidal current and that discharged through the South Discharge Canal at low tide, moves south. The sea water intake canal, located mid-way between the discharge canals, is thus designed to see reactor effluents after some dispersion in the near-shore waters. Radioiodine has so far been observed to be the most dominant airborne and waterborne contaminant, through the concentrations observed are well below the permissible limits for the media. On the basis of demographic survey of living and food habits of the population, the fishermen have been identified as the critical group in the Tarapur environment. There are evidences now from these field studies that there is considerable oscillation of near-shore waters leading to recirculation of the condenser discharges, and radioactivity is observed to be building up in the near-shore sediments. Some indicator organisms in the sea have been identified for specificity of uptake of activation products released with the reactor effluents. (Houser-NSIC)
W71-10611

SURVEY OF ENVIRONMENTAL RADIOACTIVITY FOR PERIOD JANUARY 1-JUNE 30, 1970.
Ames Lab., Iowa.
M. D. Voss.
Availability: NTIS. IS-2393, 20 pages, August 1970.

Descriptors: *Survey, *Monitor, *Radioactivity, *Sampling, Vegetation, Air pollution, Water, Rivers, Pond, Water pollution, Sedimentation, Precipitation (Atmospheric), Fallout, Wells, Nuclear reactors.
Identifiers: Surveillance Program, Ames Laboratory Research Reactor.

The environmental program consists of air samples, soil, vegetation, river water, bottom sediment, precipitation, pond water, ALRR outfall, and well water samples. This report will cover the period from January 1, 1970, to June 30, 1970. As soil and vegetation samples are collected later in the year (usually August) that data will be reported in the annual report. The data indicate that the ALRR has not contributed a significant amount of radioactivity to the environment in the Ames area. (Houser-NSIC)
W71-10612

QUARTERLY PROGRESS REPORT ON RADIOLOGICAL SAFETY OF PEACEFUL USES OF NUCLEAR EXPLOSIVES - TRANSFER OF TRITIUM TO MAN FROM AN INITIAL WET DEPOSITION,
Oak Ridge National Lab., Tenn.
M. J. Kelley and R. S. Booth.
Availability: NTIS. ORNL-TM-3134, 22 pages, January 8, 1971.

Descriptors: *Nuclear explosions, *Tritium, *Fallout, Precipitation (Atmospheric), Soil contamination, Movement, Path of pollutant, Distribution, Food chains, Equilibrium, Model studies.
Identifiers: Concentration, Dose, Man.

The total dose to man from tritium contamination of soil was estimated by simulating the movement of tritium through the soil after an initial wet deposition as a diffusion process with a superimposed translation caused by rainfall. Only experimentally demonstrable constants were incorporated into the model, and it was qualitatively tested against experimental results. Instantaneous equilibrium was assumed between the tritium concentration in the soil compartment and the food that man eats. We conclude that, except for the desert, the time-dependent concentration of tritium in the soil compartment is primarily determined by the rainfall after the deposition, and it is essentially dependent of the assumed compartment depth. (Houser-NSIC)
W71-10613

ENVIRONMENTAL MONITORING REPORT: JULY-DECEMBER 1970 AND 1970 SUMMARY.
Mound Lab., Miamisburg, Ohio.

Availability: NTIS. MLM-1795, 51 pages, April 15, 1971.

Descriptors: *Monitoring, *Radioactivity, *Air pollution, *Water pollution, Rivers, Sampling, Standards, Regulation, Radioisotopes, Tritium.
Identifiers: Great Miami River, USAEC, Plutonium.

The average concentrations of polonium-210, plutonium-238 and tritium detected in the environment surrounding Mound Laboratory, Miamisburg, Ohio, are presented for the second half of 1970 and for the entire year. (The data for the first half of 1970 were presented in Mound Laboratory document MLM-1784). The average concentrations of these radioisotopes in the Great Miami River and at the air sampling stations were well within the stringent standards adopted by the Atomic Energy Commission. The highest average concentration of these radioisotopes at any of the water sampling stations during the second half of 1970 was less than during the first half of 1970 by as much as 36%. The highest average concentration of polonium-210 at the air sampling stations during the second half of 1970 was 14% more than during the first half of 1970 (0,08% of RCG vs. 0.07% of RCG), however, the highest average concentration of the other two radioisotopes was less by as much as 57%. (Houser-NSIC)
W71-10614

ENVIRONMENTAL SURVEY OF URANIUM MILL TAILINGS, MONUMENT VALLEY, ARIZONA,
Southwestern Radiological Health Lab., Las Vegas, Nev.
R. N. Snelling.
Radiological Health Data and Reports, Vol. 11, No. 10, pp. 511-517, Oct. 1970.

Descriptors: *Survey, *Uranium radioisotopes, *Mining, Hazards, *Radioactivity, Air pollution, Water pollution, Safety, Abatement, Monitoring, Meteorology.
Identifiers: Surveillance Program, Uranium Mill Tailings, Radiation Safety and Control, Concentration.

At the request of the Navajo Tribal Council through the Public Health Service Division of Indian Health at Window Rock, Ariz., an environmental radiological survey was conducted on the Foote Mineral Company's uranium tailings pile, Monument Valley, Ariz., in May 1968. The purpose of the survey was to identify any radiation hazards which might exist and recommend methods for their control. The survey included evaluation of external gamma radiation, airborne radioactivity, and waterborne radioactivity. The results of the survey indicate that existing radiation levels do not exceed recommended exposure limits. However, to minimize the possibility of increased activity from weather conditions different from those existing during the survey, it was recommended that the mill tailings be stabilized against wind erosion. Otherwise, periodic monitoring will be necessary in the future. (Houser-NSIC)
W71-10617

LOS ALAMOS ENVIRONMENTAL MONITORING PROGRAM,
Los Alamos Scientific Labs., N. Mex.
W. R. Kennedy.
Availability: NTIS. LA-3639, 11 p, 5 fig, 8 ref, January 1970.

Descriptors: *Environment, *Monitoring, *Sampling, *Water pollution, *Air pollution, *Soil contamination, Radioisotopes, On-site data collections, On-site investigations, On-site laboratories, Absorption.
Identifiers: Gross gamma, Gross beta, Gross alpha, Concentration, Los Alamos Scientific Laboratory, New Mexico.

An outline is given of the surveillance methods used throughout Los Alamos County and outside restricted areas to determine the effect of Laboratory operations on the environmental radioactivity. Gamma radiation measurements are routinely made. Scheduled samples of air and water are taken, assayed for gross alpha and beta activity, and also for certain specific nuclides which may be present in some concentration. Soil samples are taken when considered necessary. (Houser-NSIC)
W71-10622

ESTIMATION OF THE SURFACE WATER CONTAMINATION BY THE NEAR FALLOUT BY NUCLEAR EXPLOSIONS (In German),
Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany).
W. Jacobi, and N. Stolterfoht.
Availability: NTIS. HMI-B-86, 42 pages, August 1969.

Descriptors: *Nuclear explosions, *Fallout, *Air pollution, *Soil contamination, *Water pollution, Path of pollutant, Rivers, Ohio River, Hazards, Civil Defense.
Identifiers: Drinking water, Japan, Germany, Concentration.

Reports the special problem of fallout from nuclear explosions as related to contamination of surface water and its pathway to man from drinking water. The various aspects of concentration, transport, diffusion, and dilution are considered. The aspects of meteorology and terrain all are also considered. The report is considered from the interest of communities drinking water and as a civil defense project. (Houser-NSIC)
W71-10623

CONTAMINATION OF THE RIVER WATER BY THE FALLOUT AFTER EXTREME REACTOR ACCIDENT (In German),
Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany).
W. Jacobi, and N. Stolterfoht.
Availability: NTIS. HMI-B-87, 61 pages, Berlin (West Germany).

Descriptors: *Accidents, *Fallout, *Water pollution, *Path of pollutant, *Hazards, *Surface waters, Rivers, Oceans, Tides, Radioactivity effects.
Identifiers: Concentration, Drinking water.

A study of the many aspects of contamination and its pathway to man resulting from a possible extreme reactor accident. Special concern is given to the hazardous surface water, the contamination path, contamination resulting from fallout on surface waters and subsequent incoming tides and the effects of contamination of river water. (Houser-NSIC)
W71-10624

OFF-SITE SURVEILLANCE ACTIVITIES OF THE SOUTHWESTERN RADIOLOGICAL HEALTH LABORATORY FROM JANUARY THROUGH JUNE 1969.
Southwestern Radiobiological Health Lab., Las Vegas, Nev.

Availability: NTIS. SWRHL-97-r, 41 pages, February 1971.

Descriptors: *Survey, *Radioactivity, *Nuclear explosions, Testing, Water pollution, Milk, Population, Air pollution, Water pollution sources.
Identifiers: Surveillance Program.

During the period January through June 1969, eleven announced nuclear detonations were conducted at the Atomic Energy Commission's Nevada Test Site. None of these events released radioactivity material that was detected off-site. No domestic water or milk samples collected during this period contained fresh fission products. Exposure to the off-site population during this period was well below the safety criteria established by the Atomic Energy Commission. (Houser-NSIC)
W71-10625

PROJECT GASBUGGY OFF-SITE RADIOLOGICAL SAFETY REPORT GB-2R, PHASE 1 PROGRAM.
Southwestern Radiological Health LAB., Las Vegas, Nev.

Availability: NTIS. SWRHL-105-R, 20 pages, July 1970.

Descriptors: *Survey, *Nuclear explosion, *Testing, *Sampling, Control, Safety, Water, Vegetation, Soil contamination, Tritium, Air pollution, Water pollution.
Identifiers: Surveillance Program, Peaceful uses, Radiation safety and control, Dosimetry, Concentration.

This surveillance was the continuation of the previous off-site surveillance program for Gasburry, and consisted of (A) Operating a daily air sampling network, (B) Placing thermoluminescent dosimeters in a network around the site, (C) Monitoring for radioactivity, (D) Taking special air samples during flaring operations, and (E) Collecting water, vegetation, and soil samples after completion of testing operations. (Houser-NSIC)
W71-10626

MEASUREMENT OF FALLOUT RADIOACTIVITY IN GREENLAND IN 1969 ARE REPORTED,
Danish Atomic Energy Commission, Risoe.
A. Aarkrog, and J. Lippert.
Availability: NTIS. RISO-222, 19 p, July 1970.

Descriptors: *Environment, *Fallout, *Measurements, *Strontium, Radioisotopes, *Cesium, Precipitation (Atmospheric), Oceans, Vegetation, Animals, Water, Human population, Diets.
Identifiers: Drinking water, Concentration, Greenland.

Measurements of fall-out radioactivity in Greenland in 1969 are reported. Sr-90 (and Cs-137 in most instances) was determined in samples of precipitation, sea water, vegetation, animals, and drinking water. Estimates of the mean contents of Sr-90 and Cs-137 in the human diet in Greenland in 1969 are given. (Houser-NSIC)
W71-10627

SURVEY OF ENVIRONMENTAL RADIOACTIVITY,
Ames Lab., Iowa.
Milo D. Voss.
Availability: NTIS. IS-2541, 38 p, February 1971.

Descriptors: *Monitoring, *Nuclear reactors, *On-site laboratories, *Air pollution, *Water pollution, *Soil contamination, Vegetation, Rivers, Fallout, Sedimentation, Precipitation (Atmospheric), Surface waters, Sampling, Standards, Ponds, Regulation, Wells.
Identifiers: Ames Laboratory, ALRR (RR), Bottom sediment.

This is the environmental monitoring program of the Ames Laboratory of the USAEC for the Ames Laboratory Research Reactor (ALRR). The environmental program consists of gross alpha and beta determinations of air, soil, vegetation, river water, ALRR outfall, bottom sediment, precipitation, well water, and pond samples. The ALRR reached full power as of 7/12/65. The ALRR had generated 105409 megawatt hours as of 12/31/69. A total of 34051 megawatt hours was generated in 1970. The data indicate that the ALRR has not contributed a significant amount of radioactivity to the environment in the Ames area. Radioactivity levels recorded for environmental samples represent background conditions from atmospheric fallout and naturally occurring radioactivity. (Houser-NSIC)
W71-10628

ENVIRONMENTAL RADIOACTIVITY IN THE FARVOS IN 1969,
Danish Atomic Energy Commission, Risoe.
A. Aarkrog, and J. Lippert.
Availability: NTIS. RISO-221, 22 p, July 1970.

Descriptors: *Survey, *Monitoring, *Measurement, *Fallout, *Radioactivity, Strontium radioisotopes, Cesium, Water, Sampling, Fish, Grasses, Ecology, Precipitation (Atmospheric), Milk, Food and cover crops, Food chain, Animal, Mammals, Diets, Oceans.
Identifiers: Surveillance Program, Concentration, Drinking water, Vertebrates, Denmark, Faroes.

Measurement of fall-out radioactivity in the Farcoes in 1969 are presented. Sr-90 (and Cs-137 in most instances) was determined in regularly collected samples of precipitation, grass, milk, lamb, fish, bread, and drinking water. In addition, analyses of spot samples of potatoes, sea water, sea plants, birds, vegetables, eggs, and human bone were carried out. Estimates of the mean contents of Sr-90 and Cs-137 in the human diet in the Faroes in 1969 are given. (Houser-NSIC)
W71-10629

ENVIRONMENTAL MONITORING REPORT - JANUARY-JUNE 1970
Mound Lab., Miamisburg, Ohio.

Availability: NTIS. MLM-1784, 36 pages, January 25, 1971.

Descriptors: *Environment, *Monitoring, *Radioisotopes, *Tritium, Measurement, Rivers, Water pollution, Air pollution, Water pollution sources, Standards, Regulation, Ohio.
Identifiers: Polonium, Plutonium, Concentration, Miami River, USAEC.

The average concentrations of Polonium-210, Plutonium-238, and Tritium detected in the environment surrounding Mound Laboratory, Miamisburg, Ohio, are presented for the first half of 1970. The average concentrations of these radioisotopes in the great Miami River and at the air sampling stations were well within the stringent standards adopted by the Atomic Energy Commission. (Houser-NSIC)
W71-10630

ENVIRONMENTAL MONITORING FOR USA LICENSED POWER REACTORS,
Atomic Energy Commission, Washington, D.C.
C. K. Beck.
Availability: Unipub, Inc., P.O. Box 433, New York, N.Y. 10016. Proceedings IAEA SM-146-54, August 1970. p 401-412, 3 tab, 4 fig.

Descriptors: *Monitoring, *Environment, *Effluents, *Nuclear Power Plants, *Nuclear reactors, Survey, Radioactivity, Regulation, Control discharge measurement, Standards, Streams, Rivers, Lakes, Ponds, Oceans, Aquatic life, Permits, Aircraft, Radio-ecology, Ecosystem, Radiation, Profiles.
Identifiers: Surveillance Program, Codes and Standards, Procedures and Manuals.

The regulatory staff of the USAEC establishes, through its regulations and in the unique conditions included in each license for a nuclear power reactor, the routine effluents permitted from each reactor and the monitoring requirements the licensee must carry out on effluent streams and in environmental surveillance. The required scope of environmental monitoring around facilities varies over a considerable range depending on the level of effluents with respect to the maximum levels permitted; the lower the level of effluents the nearer the monitoring program may be to the minimum level defined. Uniform procedures and format have been developed for the periodic reporting of effluents and environmental monitoring data by licensees. In addition to the monitoring data required of the licensees, the USAEC carries out an 'independent measurements' surveillance and double-checking program. Recently, for carrying out this surveillance, the USAEC embarked on a joint collaborative program (initially on a contract basis) with those states in which nuclear facilities are located and with the Bureau of Radiological Health (US Dept. of Health, Education and Welfare) as an advisory participant. An important feature of this independent surveillance program is the use of specifically equipped aircraft capable of measuring, with a surprisingly high precision, (1) the radiologic profiles of ground deposits, both naturally occurring and synthetic, (2) the gaseous effluent plume patterns, and (3) the isotopic composition of ground deposits and plumes. These various elements of the overall monitoring of licensed plants will be described in some detail, together with tabulations of reactor effluent data recorded to date. (Houser-NSIC)
W71-10633

RESEARCH ON THE MAXIMUM RADIOACTIVE BURDEN OF SOME GERMAN RIVERS,
Bundesforschungsanstalft fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
W. Feldt.
Availability: Unipub, Inc. P.O. Box 433, New York, N.Y. 10016. Proceedings of IAEA-SM-146-29, Aug. 1970, 5 tab, 4 fig, p 495-506.

Descriptors: *Water pollution, *Rivers, *Regulation, *Standards, Radioisotopes, Cesium, Iron, Copper, Monitoring, Environment, Aquatic life, Fish, Measurement, Ecology, Ecosystem, Manganese, Zinc radioisotopes, Iodine radioisotopes.
Identifiers: Germany, Rivers, Ems, Weser, Elbe, Strontium, Background, Zinc.

The maximum permissible radioactive burden of a river restricts the numbers of nuclear power stations and their releases of activity. The paper describes methods and ideas used to get relevant information before a nuclear power station goes into operation. The resulting data make effective monitoring possible. The concentrating factors for fishes and aquatic plants are given for the elements Sr, Cs, Mn, Zn, Cu and Fe in the rivers Ems, Weser and Elbe. The coice of certain biological indicators for monitoring purposes are interpreted. Measurement problems are discussed for the cases of accidental release of higher activities. (Houser-NSIC)
W71-10635

BIOLOGICAL EFFECTS OF COPPER AND ARSENIC POLLUTION,
Alaska Univ., College, Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W71-10637

HANDBOOK OF TOXICITY OF PESTICIDES TO WILDLIFE,
Bureau of Sport Fisheries and Wildlife, Denver, Colo. Denver Wildlife Research Center.
For primary bibliographic entry see Field 05C.
W71-10670

SAMPLING OF GLACIAL SNOW FOR PESTICIDE ANALYSIS,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 05A.
W71-10675

AGRICULTURE AND THE POLLUTION PROBLEM,
For primary bibliographic entry see Field 05G.
W71-10678

SHELL OIL CO V AINSWORTH (EVIDENCE INSUFFICIENT TO LINK WATER POLLUTION WITH OIL WELL).
For primary bibliographic entry see Field 06E.
W71-10681

COAL, COAL BY-products, and COAL MINE DRAINAGE,
James F. Boyer.
Journal Water Pollution Control Federation, Vol 43, No 6, p 1008-1014, Jun 1971. 6 p, 60 ref.

Descriptors: *Reviews, *Acid mine water, *Water pollution control, *Water pollution treatment, Acidity, Neutralization, Acid streams, Mine wastes, Mine drainage, Iron bacteria, Mine acids, Water pollution sources, Path of pollutants, Water pollution effects, Bibliographies.

The recent literature on causes, treatment, and prevention of coal mining pollution is reviewed. The topics covered include formation of acid drainage, effects of acid drainage, abatement, mine sealing, land reclamation, pollution treatment, neutralization, demineralization, disposal, biochemistry, and water quality improvement. (See also W71-10691) (Knapp-USGS)
W71-10694

WATER POLLUTION BY OIL SPILLAGE,
P. C. Walkup.
Journal Water Pollution Control Federation, Vol 43, No 6, p 1069-1080, Jun 1971. 12 p, 47 ref.

Descriptors: *Reviews, *Water pollution sources, *Water pollution treatment, *Oily water, Oil industry, Oil wells, Oil fields, Transportation, Oil wastes, Ships, Bibliographies.
Identifiers: *Oil spills, *Oil spill treatment.

Recent literature on oil-spill pollution is reviewed. There was general agreement that the most significant source of oil which pollutes the sea has its origin in ships; overboard discharge occurs following the cleaning of the cargo tanks of oil tankers and deballasting of tankers, dry cargo ships, and passenger ships. Oil tankers undoubtedly constitute the largest source of pollution caused by ships because the tonnage of petroleum moving by sea substantially exceeds the combined tonnage of all other commodities. Discharge of tank washings was undoubtedly the biggest source of pollution and consequent fouling of beaches. Offshore oil wells are another potential source of massive oil release. Natural seepages exist off the coast of the U.S. mainly in two areas: the Gulf of Mexico and the Pacific Ocean off Southern California. Countermeasures against oil spilled on water surfaces include: (a) mechanical skimmers, pumps, spreaders, collectors, booms, and weirs; (b) chemical emulsifiers or detergents, combustion promoters, and biological degradation agents; and (c) chemo-mechanical sinking, sorption, agglomeration, chemical booms and others, all, with the exception of sinking, being accompanied by a mechanical recovery technique. (See also W71-10691) (Knapp-USGS)
W71-10695

ACCUMULATION OF MERCURY AND ITS COMPOUNDS,
T. A. Wojtalik.
Journal Water Pollution Control Federation, Vol 43, No 6, p 1280-1292, Jun 1971. 13 p, 76 ref.

Descriptors: *Reviews, *Heavy metals, *Poisons, *Path of pollutants, *Water pollution effects, Public health, Bibliographies, Safety, Water pollution control, Water pollution treatment, Wildlife, Fish.
Identifiers: *Mercury.

Recent work on mercury pollution is reviewed. Mercury in any form can change to other forms in aquatic environments. Entry, translocation, deposition, and elimination from aquatic animals are independent functions. Accumulation results from both tissue absorption and membrane passage at the gill. Blood transport is rapid, while mercury loss is slow because of its complexing, binding, and adhering to proteins. The presence of mercury in water and plant and animal life is a serious problem. In Japan, it was shown that 110 people were debilitated or died as a result of eating mercury-contaminated fish. The method of mercury assimilation in biological forms is not well understood but seems intimately related to the presence of thiol groups in differing concentrations within and without the receiving cells. Transport may be by the same mechanism or by iron and/or magnesium solution into the mercury compound. (See also W71-10691) (Knapp-USGS)
W71-10697

THE DEEP METABOLISM: OXYGEN CONSUMPTION IN ABYSSAL OCEAN WATER,
Scripps Institution of Oceanography, La Jolla, Calif.
H. Craig.
Journal of Geophysical Research, Vol 76, No 21, p 5078-5086, Jul 20, 1971. 9 p, 3 fig, 21 ref.

Descriptors: *Oxygen demand, *Sea water, *Mixing, Oxidation, Carbon, Organic matter, Diffusion, Respiration, Aquatic microorganisms, Water chemistry, Dissolved oxygen, Advection, *Water pollution sources.
Identifiers: *Abyssal ocean water.

The question of a significant rate of in-situ oxygen consumption in deep water is examined from two viewpoints: (1) the prediction of deep-water extrema in the oxygen-inorganic carbon system as a function of latitude by the simple vertical-diffusion vertical-advection model with 02 consumption and a particulate flux, and (2) a critical examination of existing data on dissolved organic carbon that have been interpreted as inconsistent with in-situ oxidation in deep water. Both considerations indicate that in situ oxidation and solution of carbon in Pacific Deep Water occur with time scales roughly comparable to those for circulation and mixing. The existence of a presumably heteotrophic, large phytoplankton community with maximum concentrations in deep water is entirely consistent with the evidence for significant turnover of the dissolved organic carbon at these depths. (Knapp-USGS)
W71-10700

TRACE METALS: UNKNOWN, UNSEEN POLLUTION THREAT.

Chemical and Engineering News, Vol 49, No 29, p 29-30, 33, Jul 19, 1971. 3 p, 2 fig, 1 tab.

Descriptors: *Pollutants, *Trace elements, *Pollution abatement, *Metals, *Chemical wastes, Water pollution, Air pollution, Ecology, Industrial wastes, Environmental effects, Research and development, Chemical properties, Investigations, Water pollution sources.
Identifiers: *Trace metals.

Many chemical companies are now conducting internal surveys to hunt down possibly harmful trace elements in their processes. Dow Chemical, BASF Wyandotte, Georgia-Pacific, Kaiser Aluminum and Chemical, and Weyerhaeuser all have such surveys under way. In Dow's case, 30 elements are on the check list, indicating the diversity of trace elements that may be involved in typical chemical processes. In most cases little is known about the environmental hazards these elements may expose. The elements on Dow's list are chromium, cadmium, zinc, arsenic, nickel, lead, antimony, copper, thorium, cobalt, ruthenium, selenium, tellurium, boron, tin, strontium, cesium, barium, manganese, silver, beryllium, magnesium, thallium, yttrium, rubidium, cerium, molybdenum, osmium, vanadium, and bismuth. The Texas Water Quality Board has found that 1600 pounds per day of lead, 7900 pounds per day of zinc, 5000 pounds per day of cadmium, and 300 pounds per day of chromium were discharged primarily to the Houston Ship Channel in 1969. The observed concentrations were grossly in excess of those occurring in nature--more than 63,000 times for lead, 15 for cadmium, and 108,000 for chromium. (Woodard-USGS)
W71-10705

WATER QUALITY STUDY OF THE FLINT RIVER.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.

September 1970. 59 p, 11 fig, 15 tab.

Descriptors: *Eutrophication, *Water quality, *Sewage effluents, *Waste water (Pollution), On-site data collections, Biochemical oxygen demand, Nutrients, Municipal wastes, Turbidity, Water pollution effects, Michigan.
Identifiers: *Flint River.

The quantity and strength of waste discharges to the Flint River, downstream from Flint were determined. It was also desired to determine the severity of chemical, physical, bacteriological and biological degradation of the river from these discharges. A survey was made of a 45 mile stretch of the River below Flint. Numerous industrial and domestic waste discharges enter the river within the City of Flint. The Flint Wastewater Treatment Plant is the largest single source of waste load to the River in the 45 mile stretch studied. Nutrients from the plant have caused excessive and nuisance quantities of plant and algal growths in more than thirty miles of the Flint River below Flint. The most serious effect of these plant growths is their influence on dissolved oxygen levels. During night hours, approximately ten miles of the river had dissolved oxygen concentrations that did not meet the Michigan Intrastate Water Quality Standards. Certain species groups of animals generally found in abundance in organically enriched fast water habitats, such as are encountered below the Flint Wastewater Treatment Plant, were either completely absent or present in very low numbers. In the absence of toxic waste components in the river, it appears that dissolved oxygen was the principal limiting factor on the stream biota. (Poertner)
W71-10741

STORM AND COMBINED SEWER POLLUTION SOURCES AND ABATEMENT--ATLANTA, GEORGIA.
Black, Crow and Eidsness, Inc., Gainesville, Fla.

Available from the National Technical Information Service as PB-201 725, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, January 1971. 181 p, 48 fig, 28 tab, 10 ref, append. EPA Program 11024 ELB 04/71.

Descriptors: *Overflow, *Storm runoff, *Waste water treatment, *Rainfall-runoff relationships, Storm drainage, Water quality, Storage capacity, Cost-benefit analysis, Frequency analysis, Land

use, Pollutants, Treatment facilities, Water pollution sources, Water pollution control, *Pollution abatement, Costs, Simulation analysis, Georgia, Urbanization.
Identifiers: *Combined sewers, *Atlanta (Ga), Overflow quantity, Urban drainage.

Six urban drainage basins in Atlanta, Georgia, served by combined and separate sewers, were studied to determine the major pollution sources during storm events. Rainfall frequency analysis and simulation techniques were utilized to obtain design criteria for alternative pollution abatement schemes. High frequency storms cause the worst impact and most of the pollution from combined sewer areas. Annual BOD from these areas is 2,078,000 pounds, or 460 lbs/acre, of which 57 percent is due to storms of two--week or higher frequency. Bypassing of waste water treatment plant flows during storms adds 690,000 pounds BOD/year. Runoff from storm--sewered areas, at 253 lbs/acre, adds 5,577,000 pounds/year. Overflows and bypassed flows have severe impact upon the South River, due to their high deoxygenation rates and coliform concentrations. Annual BOD reduction from combined sewer areas of 57 percent may be achieved for a total annual cost of $165,000, by modifying the three regulators and treating 80 percent of the overflows, in conjunction with storage sufficient to contain a two--week storm. Alternate, less favorable solutions include storage and treatment at existing treatment plants, and storage with release to receiving streams after chlorination. Separation of combined sewers would achieve 60 percent BOD removal for $3,030,000/year.
W71-10749

EFFECTS OF STREAM CHANNELIZATION ON FISHES AND BOTTOM FAUNA IN THE LITTLE SIOUX RIVER, IOWA,
Iowa State Univ, Ames. Water Resources Research Inst.
Douglas R. Hansen.
Available from the National Technical Information Service as PB-201 746, $3.00 in paper copy, $0.95 in microfiche. Completion Report ISWRRI-38, June, 1971, 119p, 12 fig, 14 tab, 55 ref. OWRR Project No. A-035-IA (1).

Descriptors: *Channeling, Water pollution sources, Regime, *Channel catfish, Catfishs, Iowa, Fish populations, Channel flow, *Water temperature, *Turbidity, Invertebrates, Fish, Fish migration, Aquatic environment, *Benthic fauna, Environmental effects.
Identifiers: *Channelization, Unchanneled flow, *Little Sioux River (Iowa).

Differences in certain physical factors, bottom fauna and fish populations were evaluated in channelized and unchannelized portions of the Little Sioux River, Iowa, during 1969-71. Little Sioux River is a turbid, warmwater river located in western Iowa. Characteristic stream channels were a meandering, non-uniform channel with heavy vegetative cover in the unchannelized section; and a straight channel with relatively uniform depth and no heavy vegetative cover in the channelized section. Water temperatures showed greater daily fluctuations during summer in the channelized section. Maximum and mean daily water temperatures averaged 0.3 C and 1.3 C, greater, respectively, in the channelized section during July. Consistently higher turbidities were measured in the channelized section during a period of low runoff, averaging 31.2% higher than the unchannelized section. Composition of bottom fauna was similar in the two sections. Colonization of macroinvertebrates on artificial substrates suggested a lack of suitable attachment areas in the channelized section. Higher numbers of drift organisms in the channelized section provided supported evidence. Numbers of fish species were greater in the unchannelized section. Major changes in composition of fishes reported in 1950 studies resulted from a control structure near the mouth, blocking upstream movement of certain species from Missouri River. Unbaited hoopnet catches revealed the presence of more large channel catfish, the most important game species, in the unchannelized section. Hoopnet catches and Primacord explosive samples collected greater numbers of smaller channel catfish (less than 254 mm) in the channelized section during late summer and early fall. Because of possible downstream movement from unchannelized section into channelized section, suggested by movement studies and similar growth rates, drastic differences in standing crops of fish were not measurable in comparisons of the two areas.
W71-10751

FREE VORTEX RECOVERY OF FLOATING OIL, CONCEPT FEASIBILITY STUDY,
Scientific Associates Inc, Santa Monica, Calif.
For primary bibliographic entry see Field 05G.
W71-10762

NATURAL OIL SEEPS IN OR NEAR THE MARINE ENVIRONMENT: A LITERATURE SURVEY,
Coast Guard, Washington, D.C.
Thomas C. Johnson.
Available from the National Technical Information Service as AD-723 310, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Technical report 714141/002, April 1971, 30p.

Descriptors: *Oil wastes, *Water pollution sources, *Seepage, *Marine geology.
Identifiers: *Bibliographies, Marine biology, Alaska, California, Newfoundland (Province), Trinidad, Mexico Gulf, *Oil pollution, *Natural oil seepage.

A literature survey was conducted to determine where naturally occuring oil seeps have been reported to be injecting oil into the sea. The purpose of this was to locate natural laboratories where fate and behavior studies on oil in the marine environment might be conducted. Emphasis was placed upon seeps in the northern half of the Western Hemisphere. Results of these studies will contribute to the establishment of a logical marine pollution monitoring program by the U.S. Coast Guard. Of the locations determined, those which are most likely to be useful for planned Coast Guard studies are: near Barter Island, Alaska; southern California; western Newfoundland; and in the Gulf of Paria west of Trinidad.
W71-10763

CONTROL OF HAZARDOUS POLLUTING SUBSTANCES.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-10764

A FEASIBILITY STUDY OF THE USE OF THE OLEOPHILIC BELT OIL SCRUBBER,
Shell Pipe Line Corp., Houston, Tex. Research and Development Lab.
For primary bibliographic entry see Field 05G.
W71-10765

ENGINEERING FEASIBILITY STUDY OF THE BISHOP SYSTEM FOR OPEN OCEAN OIL SPILLS.
Bishop (William R) and Associates, San Francisco, Calif.
For primary bibliographic entry see Field 05G.
W71-10766

LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
Northeastern Radiological Health Lab., Winchester, Mass.
P. Magno, T. Reavey, and J. Apidianakis.
Available from the National Technical Information Service as PB-196 442, $3.00 in paper copy, $0.95 in microfiche. Technical report, BRH/NERHL-70-2, Nov 1970. 69 p. Public Health Service, Bureau of Radiological Health.

Descriptors: *Water pollution sources, *Radioactivity effects, *Nuclear wastes, Tritium, Strontium radioisotopes, Radioisotopes, Sediments, Sampling, *Pollutant identification, New York.
Identifiers: *Radioactive contaminants, *Nuclear fuel reprocessing, Concentration (Composition), Ruthenium isotopes, Strontium 90, Cesium 137, Cesium 134, Purex process, Dilution, Ruthenium 106, *Water pollution detection, Cattaraugus County (New York).

The liquid waste effluents from Nuclear Fuel Services were studied in detail during a six-month period May through October 1969. The concentrations and amounts of individual radionuclides discharged from the plant were measured and the amounts of sedimentation of individual radionuclides in the lagoon system were estimated. Tritium, ruthenium-106, strontium-90, cesium-137 and cesium-134 were the principal radionuclides discharged to the environment during this period. No relationship could be established between the amount and burnup of fuel processed and the amount of activity discharged from the plant to the lagoon system during this study. For the Yankee fuel campaign of May-August 1969, the waste management practice and not the amount of fuel processed was the controlling factor in the amount of activity discharged from the plant to the lagoon system. During June and November 1969 simultaneous sampling was carried out at the point of discharge of the waste and several locations on the Buttermilk and Cattaraugus Creeks. Tritium, ruthenium-106, and strontium-90 were the radionuclides present in the highest concentrations in these streams during these periods. Stream dilution and absorption factors were calculated for individual radionuclides at various locations along the stream system. A comparison of the concentrations of the radionuclides in Cattaraugus Creek with 10CFR20 discharge concentration limits showed that strontium-90 was about 20 percent of the concentration limit during both sampling periods. All other radionuclides were less than 10 percent of the concentration limits during these periods.
W71-10769

METABOLISM AND TOXICITY OF PESTICIDES,
Joint Publications Research Service, Washington, D.C.
M. Sh. Vekshtein, I. I. Khitsenko, O. N. Elizarova, and D. P. Nuzhdina.
Available from the National Technical Information Service as JPRS-52743, $3.00 in paper copy, $0.95 in microfiche. Translated from Gigenya i Sanitariya, Jan 1971.

Descriptors: *Pesticides, *Motabolism, *Toxicity, *Thiocarbamate pesticide, Cytological studies.
Identifiers: *Toxicology, Tissue culture, Cells, Biology, Mitosis, Translations, USSR, *Ziram, *Zineb.

Two papers are translated from the Russian: Zirame metabolism in the organism of warmblooded animals. Use of the tissue culture method to assess the toxicity of pesticides.
W71-10796

CONCEPT DEVELOPMENT OF A PROTOTYPE LIGHTWEIGHT OIL CONTAINMENT SYSTEM FOR USE ON THE HIGH SEAS,
Johns-Manville Research and Engineering Center, Manville, N.J.
For primary bibliographic entry see Field 05G.
W71-10803

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1970,
Naval Ship Systems Command, Washington, D.C., Nuclear Power Directorate.
M. E. Miles, J. J. Mangeno, and R. D. Burke.
Radiological Health Data and Reports, Vol 12, No 5, p 235-244, May 1971. 10 p, 6 tab, 20 ref.

Descriptors: Water pollution, *Harbors, *Radioactive wastes, *Ships, *Environmental effects, Monitoring, Water analysis, Water quality, Wastes, Path of pollutants, Analytical techniques.
Identifiers: *Nuclear-powered ships.

Data are summarized on disposal of radioactive wastes from U.S. Naval nuclear-powered ships and their support facilities and results of environmental monitoring performed to confirm adequacy of waste disposal limits and procedures. The total radioactivity discharged into all ports and harbors was 0.024 curies in 1970, less than one hundredth the total annual discharges of the early 1960's. Results of environmental surveys of harbor water and bottom sediment for gross radioactivity and for cobalt-60 show that (1) no increase in radioactivity above normal background levels has been detected in harbor water, (2) discharges of liquid wastes from U.S. Naval nuclear-powered ships have not caused a measurable increase in the general background radioactivity of the environment, and (3) low-level cobalt-60 radioactivity is detectable in localized areas of harbor bottom sediment around a few piers at operating bases and shipyards where maintenance and overhaul of Naval nuclear-powered ships have been conducted over a period of several years; these levels have decreased in recent years. This report confirms that procedures used by the Navy to control discharges of radioactivity from U.S. Naval nuclear-powered ships and their support facilities have been effective in protecting the health and safety of the general public. (Woodard-USGS)
W71-10809

MEDITERRANEAN POLLUTION--ANOTHER YEAR OF NEGLECT,
Tony Loftas.
New Scientist and Science Journal, Vol 51, No 760, p 144, July 15, 1971. 1 p.

Descriptors: *Water pollution sources, *Oceans, *Pollutant identification, Industrial wastes, Municipal wastes, Agricultural chemicals, Oil wastes, Oily water, Sewage, Water pollution control.
Identifiers: *Water pollution (Mediterranean Sea), Atlantic Ocean.

The Mediterranean is fast becoming a very sick sea. Its malaise stems from a rapidly growing burden of pollutants ranging from oil and sewage to industrial effluent and agriculture runoff. Already the Gulf of Muggia near Trieste, which receives effluent from quite a large complex of refineries and other industrial plants is, biologically speaking, a desert, partly devoid of life and partly populated by less than ten most resistant species. Every one of the 6000 registered beaches in Italy is dangerously polluted according to the standards recently decreed by the Health Ministry. The Italian National Federation of Bathing Beaches has complained that the Standards--100 bacteria per 100 c.c. of water--are too tough, but this has been counteracted by claims in the Rome newspaper Giornale d'Italia that several beaches have counts five times higher than the limit. (Woodard-USGS)
W71-10816

LONGITUDINAL DISPERSION IN NON-UNIFORM FLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
H. H. Carter, and A. Okubo.
Chesapeake Bay Institute, Johns Hopkins University Technical Report 68, November 1970. 46 p, 21 fig, 7 tab, 14 ref, append. ONR Contract Nonr 4010 (11), Project NR 083-016.

Descriptors: *Dispersion, *Diffusion, *Mixing, *Path of pollutants, *Estuaries, Mathematical models, Non-uniform flow, Unsteady flow, Convection, Maryland, Dye releases, Tracers, Tides.
Identifiers: *Longitudinal dispersion.

In estuaries, non-uniform flow results from the increase of cross-sectional area in the downstream direction. A solution to the convective-diffusion equation for this type of estuary is obtained in terms of the estuarine geometry and the Longitudinal Diffusion Coefficient. The model is applied to the results of two dye tracer experiments carried out in the upper Patuxent River during August 1969 and the Longitudinal Dispersion Coefficients quantitated. The concept of a flushing velocity for an estuary is developed and defined. (Knapp-USGS)
W71-10822

LAND TREATMENT AND WATER QUALITY CONTROL,
Colorado State Univ., Fort Collins. Dept. of Recreation and Watershed Resources.
For primary bibliographic entry see Field 05G.
W71-10881

DEICING WITH SALT: SOME PROS AND CONS,
Department of Public Works, Greenfield, Mass.
Robert S. Pryzby.
Public Works, Vol 102, No 3, p 80-81, March 1971, 2 photo.

Descriptors: *Deicers, *Salts, *Sands, *Runoff, Water pollution sources, Massachusetts.
Identifiers: *Salt deicing, Greenfield (Mass).

Citizens of Greenfield, Massachusetts, who were concerned about the method of deicing the roads with salt, wanted to know why sand could not be used for the same purpose. They were worried about the effect of the salt and brackish water on their lawns and gardens, on their cars, and on the pavement of the roadways. The author contends that salt causes no effective damage to vegetation, automobiles, or pavement. Salt, by breaking the bond between the ice and the pavement surface, works effectively to control snow and ice, increasing safety of winter time travel and saving time. Salt is easily handled by normal runoff and what remains on lawns is washed off by spring rain. Sand alone is a disposal problem which puts a heavy load on the drainage system. Furthermore sand does not act to break the bond between the ice and the pavement, and is usually ground into the layer of snow or ice, therefore not even providing traction. The main problem of using salt is its storage. The stockpiles of salt must be rigidly controlled against excessive runoff. Uncontrolled runoff presents a major problem, and not the limited amount of salt which is spread on the streets for the purpose of deicing. (Stachan-Chicago)
W71-10888

THE CAUSES OF POLLUTION,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
Barry Commoner, Michael Corr, and Paul J. Stamler.
Environment, Vol 13, No 3, p 2-19, April 1971, 3 fig, 1 tab, 11 photo, 24 ref.

Descriptors: *Pollution abatement, *Environment, *Urbanization, Population.
Identifiers: *Environmental degradation, *Pollution, *Environmental impact index, Affluence, Per capita consumption, Overpopulation.

There are three factors which result in pollution (according to Paul Ehrlich): population size, per capita consumption, and an 'environmental impact' index which measures the application of technology to consumption. Limiting itself to the United States and its pollution problems between 1946-1968, the paper asks what changes in the levels of specific pollutants, in population size, in environmental impact per unit of production, and in the amounts of good produced per capita have occurred. The authors conclude that the primary factor involved in continual environmental degradation is the increasing environmental impact per unit of production due to technological changes, and not population size or per capita consumption. If environmental impact per unit of production increases then environmental degration will continue despite any existence of a stable population and stable consumption habits on the part of the population. The environmental impact per unit continues to increase at present in part because of displacement in which new, high-impact technologies are predominant. Social choices with regard to productive technology are inescapable in resolving the environmental crisis. (Strachan-Chicago)
W71-10889

STUDY, INVESTIGATION AND EXPLORATION OF UNDERGROUND WATER SUPPLY (TEXAS); NATURAL POLLUTION OF TRIBUTARIES OF RED RIVER: STUDY OF CAUSES AND MEANS OF ELIMINATION.
For primary bibliographic entry see Field 06E.
W71-10930

MANUFACTURE AND USE OF CONTAMINANTS.
Indiana Stream Pollution Control Board, Indianapolis.
For primary bibliographic entry see Field 05G.
W71-10941

POLICY ON WASTEWATER TREATMENT PLANT OUTFALLS.
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W71-10946

5C. Effects of Pollution

USE OF SPINNER CULTURE CELLS TO DETECT WATER POLLUTION,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05A.
W71-10539

HISTOLOGICAL AND HEMATOLOGICAL RESPONSES OF AN ESTUARINE TELEOST TO CADMIUM,
National Marine Water Quality Lab., West Kingston, R.I.
George R. Gardner, and Paul P. Yevich.
Journal of the Fisheries Research Board of Canada, Vol 27, No 12, p 2185-2196, 1970. 5 fig, 1 tab, 44 ref.

Descriptors: *Metals, *Heavy metals, *Animal pathology, *Fish physiology, Water quality, Poisons.
Identifiers: *Cadmium, *Fundulus sp., Hematology, Fish hematology.

Pathological changes were observed in the intestinal tract, the kidney, and the gills of Fundulus heteroclitus after exposure to a cadmium concentration of 50 ppm. Pathological changes of the intestinal tract occurred as early as 1 hr after exposure, in the kidney after 12 hr, and in the gill filaments and respiratory lamellae after 20 hr. These manifestations of cadmium poisoning bear resemblance to those demonstrated clinically and experimentally in mammals. Rapid and striking changes occurred among blood cells of the eosino-

phil lineage. The abundance of eosinophils increased steadily, beginning at 4 hr post-exposure, to a level approximately 45% above normal. A reduction in the relative numbers of mature eosinophils was evident in imprints of head kidney tissue. Nuclear anomalies were associated with the thrombocytes of specimens after 8 hr exposure; however, these changes were not noticeable at either earlier or later time periods. (LeGore-Washington)
W71-10540

TOXICOLOGICAL EFFECTS OF CADMIUM ON FUNDULUS HETEROCLITUS UNDER VARIOUS OXYGEN, PH, SALINITY AND TEMPERATURE REGIMES,
National Marine Water Quality Lab., West Kingston, R.I.
George R. Gardner, and Paul P. Yevich.
American Zoologist, Vol 9, No 4, p 1096, 1969.

Descriptors: *Metals, *Heavy metals, *Animal pathology, *Fish diseases, *Water pollution effects, *Environmental effects, *Hydrogen ion concentration, *Dissolved oxygen, *Water temperature, *Salinity, Toxicity, Fish physiology, Water quality, Poisons, Acidity, Temperature, Killifishes.
Identifiers: *Cadmium, Fish hematology.

The pathological effects of cadmium on mummichog (Fundulus heteroclitus) under various environmental stresses were investigated. Oxygen tension, pH, salinity, and temperature were singly altered. Although the same lesions were produced in all cases, the rates and sequence of incidence varied. Although the sequence and degree of morphological events leading to a toxicological response in F. heteroclitus to cadmium may be altered by changes in environmental conditions, the histopathological and hematological changes remain undistinguishable from those observed under the prevalent environmental conditions of seawater. (LeGore-Washington)
W71-10541

FISH MORTALITIES IN THE NORTHWEST MIRAMICHI RIVER IN 1969,
Fisheries Research Board of Canada, St. John's (Newfoundland). Biological Station.
John H. C. Pippy.
Fisheries Research Board of Canada Technical Report No 226, December 1970. 7 p, 2 fig, 3 ref.

Descriptors: *Fish diseases, *Fishkill, *Epizootiology, *Shiners, *Suckers, *Salmonids, *Atlantic salmon, Mortality, Vectors (Biology), Bacteria, Animal diseases, Animal pathology.
Identifiers: *Bacteriology, Canada, Miramichi River (Canada), New Brunswick (Canada), Aeromonas sp.

An epizootic among Atlantic salmon and suckers occurred in the Northwest Miramichi River, New Brunswick, Canada in June and July of 1969 which was similar to those which occurred in 1967 and 1968. Comparisons of data from the three epizootics enabled formulation of the hypothesis that shiners, which apparently do not suffer from the disease, are acting as an important natural reservoir for the causative agent, Aeromonas liquefaciens. Veritication or invalidation of this hypothesis is dependent on bacteriological examination of shiners from the Northwest Miramichi River. (LeGore-Washington)
W71-10542

THE RELATIVE TOXICITIES OF YELLOW PHOSPHORUS PRODUCTION WASTES TO SEAWATER-MAINTAINED FISH,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
G. L. Fletcher, R. J. Hoyle, and D. A. Horne.
Fisheries Research Board of Canada, Technical Report No 255, 1971. 18 p, 4 fig, 2 tab, 17 ref.

Descriptors: *Water pollution effects, *Bioassay, *Environmental effects, *Phosphorous, *Sulfur compounds, *Ammonium compounds, *Fish toxins, *Water pollution sources, Lethal limit, Physiological ecology, Brook trout, Smelts, Minnows, Killifishes, Herrings, Fish conservation, Fish diseases, Fishkill, Mortality, Aquatic environment.
Identifiers: *Yellow phosphorous, *Cyanide, Fluosilicic acid, Cunner, Salvelinus sp, Osmerus sp, Fundulus sp, Tautogolabrus sp, Clupea sp.

The relative toxicities of various substances which have or may have occurred in the effluent of the elemental phosphorous plant at Long Harbour, Newfoundland were examined. Both static and continuous-flow bioassays were conducted using cyanide (CN-), sulfite (SO2), ammonium chloride (NH..4), sodium sulfide (S2-), yellow phosphorous (P4) and fluosilicic acid. Mortalities caused by fluosilicic acid were attributed merely to low pH values. Brook trout (Salvelinus fontinalis), smelt (Osmerus mordax), mummichogs (Fundulus heteroclitus), cunner (Tautogolabrus adspersus) and herring (Clupea harengus) were challanged. Yellow phosphorous is considerably more toxic than any of the other compounds. (LeGore-Washington)
W71-10543

THE POLLUTION OF THE NATURAL WATERS IN THE REGION OF GALATZ AS CONSEQUENCE OF THE OVERFALLS OF THE USED INDUSTRIAL AND HOUSWORKED WATERS (RUMANIAN: POLUAREA APELOR NATURALE IN VZATE INDUSTRIALE SI MENAJERE),
Nicolae Stoian.
Summaries in French and English. Institutul Politehnic Galati Lucrari stiintifice, Vol 4, p 405-418, 1970. 2 tab, 5 ref.

Descriptors: *Water pollution effects, *Fish toxins, *Chlorine, *Iron, *Hydrogen sulfide, *Sulfates, Toxicity, Bioassay, Fishkill, Fish physiology, Fish conservation, Fish management, Mortality, Pollutants, Aquatic environment, Environmental sanitation, Chlorination.
Identifiers: *Romania.

The effects of industrial and domestic effluents on fish of the Galatz, Romania area, and the physicochemical characteristics of the effluent components are discussed. Chlorine is the most toxic component, followed in order of decreasing toxicity by iron, hydrogen sulfide and sulphates. (LeGore-Washington)
W71-10544

MICROBIAL ECOSYSTEM STRESS INDUCED BY AN ORGANOPHOSPHATE INSECTICIDE,
Massachusetts Univ., Amherst. Dept. of Environmental Sciences.
Haim B. Gunner.
Mededelingen Faculteit Landbouw Wetenschappen Gent, Vol 35, No 2, p 581-597, 1970. 16 fig, 8 tab, 5 ref. OWRR Poject A-020-MASS (5).

Descriptors: *Diazinon, *Biological communities, *Organophosphorous pesticides, *Food chains, *Pesticide kinetics, *Path of pollutants, *Soil bacteria, *Bacteria, *Biodegradation, Agricultural chemicals, Balance of nature, Pesticide toxicity, Soil treatment, Mode of action.
Identifiers: *Arthrobacter sp, *Streptomyces sp, Microbial physiology.

The decomposition pathway and the impact on soil microflora of the organophosphate, Diazinon were investigated. Application of Diazinon greatly increases the populations of a particular Arthrobacter sp., which has a competitive advantage because it can utilize the side chain of the Diazinon molecule as its sole source of carbon, or sulfur and of phosphorous. An increase in Streptomyces sp. succeeds Arthrobacter sp., and the pyrimidine ring of Diazinon is broken down synergistically by these two bacterial species. A pathway for Diazinon degradation is postulated. Commensal protozoans did not utilize Arthrobacter sp. as readily as other bacteria, suggesting that application of Diazinon may have far reaching consequences on the soil population equilibrium. (LeGore-Washington)
W71-10545

THE UPTAKE AND DISTRIBUTION OF CHLORINATED RESIDUES BY GOLDFISH (CARASSIUS AURATUS) FED A C-14-DIELDRIN CONTAMINATED DIET,
Federal Water Quality Administration, Athens, Ga. Southeast Water Lab.
Alfred R. Grzenda, William J. Taylor, and Doris F. Paris.
Transactions of the American Fisheries Society, Vol 100, No 2, p 215-221, April 1971. 1 fig, 5 tab, 10 ref.

Descriptors: *Dieldrin, *Absorption, *Pesticide kinetics, *Fish physiology, *Pesticide residues, *Water pollution effects, *Chlorinated hydrocarbon pesticides, Bioassay, Pollutants, Distribution patterns, Path of pollutants, Persistence, Pesticides, Environmental effects, Radioisotopes, Carbon radioisotopes, Tracers, Tracking techniques, Halogenated pesticides, Insecticides, Organic pesticides, Chromatography.
Identifiers: *Goldfish, *Carassius auratus.

When goldfish were fed at regular intervals with C-14-dieldrin contaminated food, they exhibited a rapid initial uptake of radioactivity followed by a period in which the uptake rate was considerably reduced. The concentration of radioactivity in tissues was found to increase continuously during the course of the investigation. Tissues from fish fed on a diet containing a high concentration of dieldrin accumulated higher concentrations of radioactivity and at greater rates than those exposed to a lower concentration of toxicant. Fish exposed to the lower dieldrin concentration assimilated a higher percentage of the available radioisotopes than did tissues from fish exposed to higher concentrations. In all cases, mesenteric adipose tissue and testes contained the highest concentrations of radioactivity, while muscle and blood had the lowest. Thin layer chromatography of tissue extracts failed to reveal any radioactive metabolites derived from dieldrin. (LeGore-Washington)
W71-10546

POSSIBILITIES OF THE DIAGNOSIS OF AMMONIA-INTOXICATION OF FISH (CZECH: MOZNDSTIDIAGNOSTIKY INTOXIKACE RYB AMONIAKEM),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslavakia).
Z. Svobodova, and L. Groch.
Buletin VUR Vodnany, Vol 7, No 1, p 9-18, 1971. 5 fig, 5 tab, 25 ref.

Descriptors: *Ammonia, *Fish diseases, *Pathology, *Fish physiology, *Animal pathology, Bioassay, Metabolism, Animal metabolism, Biochemistry, Physiological ecology, Environmental effects, Mortality, Fishkill, Nitrogen compounds.
Identifiers: Brain, Histopathology, Physiological levels.

The brain bears the largest differences between N-ammonia levels under physiological conditions and cases of ammonia intoxication of fish. The physiological level of N-ammonia in the brain is 5.00 plus or minus 0.23 (1.48-7.38) mg %, the values higher than 11.82 being considered as unphysiological. Temperature and time of storage influence the level of N-ammonia in the tissues of fish that died or were destroyed. Significant differences between the values of N-ammonia of healthy and intoxicated fish were found in the brain at 20C only up to 24 hr after death, whereas at 4C

the differences were significant even after 72 hr. The greatest pathological changes resulting from ammonia intoxication were found in the gills and skin of fish, with smaller changes in the eye and in the body cavity. Histological examination indicates a high destructiveness of low concentrations of ammonia affecting the fish for a long period of time. It is apparent that if certain conditions are maintained (up to 48 hr storage at 4C) examination of the brain can provide for the diagnosis of ammonia intoxication of fish. Anatomical- and histopathological examinations contribute to further precision of the diagnosis. (LeGore-Washington)
W71-10548

WASTE MANAGEMENT IN THE MARINE ENVIRONMENT,
Federal Water Pollution Control Administration, West Kingston, R.I. National Marine Water Quality Lab.
Clarence M. Tarzwell.
Proceedings, Civil Engineering in the Oceans--II, Miami Beach, Florida, Dec 1969, p 477-485.

Descriptors: *Water pollution effects, *Standards, *Environmental sanitation, *Water pollution, *Water quality, *Regulation, *Public rights, *Water law, *Water allocation (Policy), *Balance of nature, Physiological ecology, Environmental effects, Legal aspects, Ecology, Limiting factors, Populations, Economics.
Identifiers: *Standard methods, Criteria, Chronic pollution.

The persistence is lamented of the 'fast-buck' philosophy, which has done so much to destroy the three basic 'elements' of the Earth on which all life depends: water, soil and air. Exploitation, destruction, pollution and mismanagement have done much to upset the balance of nature, of which man is an integral part, and without which man cannot exist. The tendency to consider development of better effluent dilution methods as the most efficacious approach to pollution is attacked. Five major elements of good waste management are presented and discussed. (LeGore-Washington)
W71-10549

MAINTAINING WATER QUALITY,
National Marine Water Quality Lab., West Kingston, R.I.
Clarence M. Tarzwell.
Transactions of the 31st North American Wildlife and Natural Resources Conference, March 14-16, 1966. Wildlife Management Institute, Washington, D.C., p 110-121.

Descriptors: *Bioassay, *Test procedures, *Water pollution effects, *Bioindicators, *Standards, *Environmental sanitation, *Water pollution, *Water quality, *Regulation, *Legal aspects, *Water law, *Water allocation (Policy), Balance of nature, Toxicity, Pollutant indentification, Lethal limit, Physiological ecology, Environmental effects, Public rights, Permits, Physiological ecology, Environmental effects, Public rights, Permits, Judicial decisions, Pollutants, Laboratory animals, Toxins, Poisons.
Identifiers: *Standard methods, Methods, Chronic pollution, Criteria.

The importace is reviewed of water and of the need to halt water pollution, defined as the man-caused addition of any material or any man-caused change in the quality or character of a water which interferes with, lessons or destroys a desired use. Several observations relative to the legitimacy of water quality criteria are presented, and the standards to be applied to establishment of such criteria are discussed. The need for accurate, efficient and repeatable tests is stressed. Although it is recognized that pollution abatement will be monetarily expensive, it is noted that 'water is not a luxury but a necessity for life, and therefore worth whatever we must pay to get it'. (LeGore-Washington)
W71-10550

I. MEASUREMENTS OF POLLUTION EFFECTS ON LIVING ORGANISMS - BIOASSAYS TO DETERMINE ALLOWABLE WASTE CONCENTRATIONS IN THE AQUATIC ENVIRONMENT,
Federal Water Quality Administration, West Kingston, National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 05A.
W71-10551

EFFECTS OF SHORT-TERM EXPOSURE OF LEUCISCUS RUTILIS L. (PISCES) TO PHENYLMERCURIC HYDROXIDE,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
P. E. Lindahl, and C. E. B. Hell.
Russian summary. Oikos, Vol 21, p 267-275, 1970. 2 fig, 6 tab, 34 ref.

Descriptors: *Phenols, *Fish physiology, *Water pollution effects, *Heavy metals, *Animal metabolism, *Animal physiology, Aromatic compounds, Organic compounds, Respiration, Metabolism, Biochemistry, Environmental effects, Biochemical oxygen demand, Oxygen requirements.
Identifiers: *Mercury, *Mercurial compounds, Leuciscus sp., Blood, Gills, Fishgills, Brain, Liver.

The effects of phenylmercuric hydroxide (PMOH) on the fish, Leuciscus rutilus, were studied after acute exposure to a concentration of 1.0 mg/l (0.3 x 10-5M). A pronounced decrease (82%) in oxygen content of blood drawn from the fish was noted. The respiration of isolated gill filaments was inhibited by about 30%. The cause of this inhibition was chiefly damage to the secondary lamellae. At a PMOH concentration of 0.5 x 10-4 M, the in vitro fish erythrocyte hemolytic half-time was 55 min. A small inhibition (9%) was found in the oxygen consumption of brain slices from animals exposed to PMOH. The oxygen uptake of liver slices and liver mitochrondria from exposed animals increased by 15 and 20%, respectively, while glycolysis was inhibited by about 20-25%. (LeGore-Washington)
W71-10552

ASSESSMENT OF POLLUTION EFFECTS BY THE USE OF ALGAE,
Liverpool Univ. (England). Hartley Botanical Labs.
For primary bibliographic entry see Field 05A.
W71-10553

THE ROLE OF ENVIRONMENTAL TEMPERATURE AND pH ON THE VARIATIONS IN K..AND TRYPTAMINE-SENSITIVITY OF GLOCHIDIA OF ANODONTA CYGNEA L,
Magyar Tudomanyos Akademia, Tihany (Hungary). Biological Research Inst.
Elemer Labos, and Ferenc Lukacsovics.
Hungarian and Russian summaries. Annals of Biology of Tihany, Vol 35, p 13-24, 1968. 8 fig, 1 tab, 15 ref.

Descriptors: *Water pollution effects, *Mollusks, *Mussels, *Shellfish, *Animal metabolism, *Hydrogen ion concentration, *Water temperature, *Potassium compounds, Metabolism, Environmental effects, Water quality, Biochemistry, Temperature, Ions.
Identifiers: *Potassium chloride, *Tryptamine, *Anodonta sp., pH, Glochidia larvae.

Under varying conditions of water temperature and pH, the rhythmic and tonic muscular responses triggered by KCl and tryptamine in glochidia of the freshwater mussel, Anodonta cygnea were investigated. Variations between bioassays run using distilled and Lake Balaton water were explained by the lack of antagonistic ions in the distilled water, in which greater sensitivity of the mussel to KCl was noted. Inconsistent seasonal variations were found. Variation in tryptamine sensitivity could not be explained by environmental changes, but seemed related to metabolic developments. (LeGore-Washington)
W71-10554

TOXICITY TO FISH OF TWO ORGANIC REACTOR COOLANTS,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment; and Atomic Energy of Canada Ltd., Pinawa (Manitoba). Environmental Control, Health and Safety Branch.
J. E. Guthrie, and O. E. Acres.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 2, p 145-151, 1970. 1 fig, 15 ref.

Descriptors: *Rainbow trout, *Bioassay, *Lethal limit, *Water pollution effects, *Coolants, *Toxicity, *Powerplants, *Nuclear powerplants, Salmonids, Trout, Industrial wastes, Water pollution sources, Environmental effects, Fish toxins, Pollutant identification, Toxins.
Identifiers: *Terphenyl compounds, Santowax OM, HB-40.

The use of terphenyl compounds to cool nuclear reactors prompted an inquiry into the effects of these substances on the aquatic environment, should they be accidentally released. Santowax OM .. 30% high boilers and HB-40 (both from Monsanto Chemical Company) are two terphenyl compounds under study as nuclear reactor coolants at Whiteshell Nuclear Research Establishment. The acute toxicity of these two coolants to rainbow trout fry has been investigated in static bioassay, and it was found that Santowax OM was the more toxic. The behavior of fish exposed to suspensions of Santowax OM in water is briefly described. (LeGore-Washington)
W71-10555

EFFECTS OF OIL AND OIL DISPERSANTS ON THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch, (England). Fisheries Lab.
R. G. J. Shelton.
Proceedings of the Royal Society of London B, Vol 177, p 411-422, 1971. 18 ref.

Descriptors: *Oil wastes, *Water pollution effects, *Water pollution treatment, *Oil-water interfaces, *Oily water, *Detergents, *Surfactants, *Reviews, *Aromatic compounds, Oil industry, Water pollution sources, Oil fields, Fuels, Oil wells, Fouling, Taste, Aquatic microorganisms, Bacteria, Bioassay, Resistance, Environmental effects, Chemical properties, Solubility.
Identifiers: *Oil pollution, *Oil spills, *Seafood taint, Taint, Microbial metabolisms, BP 1100, England, Naphthenes, Biological effects.

In the context of marine pollution, the term 'oil' can cover a very wide range of substances and usually these are themselves highly variable in their composition. The main types of oil which pollute the sea are described and the effects of weathering on the physical properties and toxicity of spilled oil are considered. The biological consequences of oil pollution are discussed and particular consideration is given to the effects on the marine environment and on commercial fisheries of the various methods which have been used in the treatment of oil spills. Current research on oil pollution topics is briefly reviewed and a number of unresolved problems are examined with suggestions for possible future research. This is a concise review of basic phenomena. (LeGore-Washington)
W71-10556

DATA TO THE CHEMICAL SENSITIVITY OF FRESHWATER MUSSEL (ANODONTA CYGNEA L.),
Magyar Tudomanyos Akademia, Tihany (Hungary). Biological Research Inst.
Ferenc Lukacsovics, and Janos Salanki.
Hungarian and Russian summaries. Annals of Biology of Tihany, Vol 35, p 25-34, 1968. 3 fig, 18 ref.

Descriptors: *Bioassay, *Mussels, *Salts, *Potassium compounds, *Calcium, *Magnesium compounds, *Sodium compounds, *Ammonia, *Ammonium compounds, Mollusks, Inorganic compounds, *Behavior, Animal behavior, Environmental effects, Physiological ecology, Water quality, *Calcium compounds.
Identifiers: *Anodonta sp., *Cadmium compounds, Threshold concentrations.

The response of the freshwater mussel (Anodonta cygnea) to various salts was examined. Closure of the outflow siphon and valve closure (adductor muscle contraction) were the criteria observed. The salts are listed in order of decreasing effect relative to excurrent siphon closure: K, Cd, Ca, Mg, NH4 and Na; and in order of decreasing effect relative to valve closure: K, Cd, NH4, Mg, Ca and Na. In the cases of Mg and NH4, the range of effective concentrations was small, whereas with K, Ca and Cd a rather great difference existed between the threshold concentration and the concentration eliciting the most pronounced effect. (LeGore-Washington)
W71-10557

METABOLISM OF PESTICIDES IN MARINE ORGANISMS, I. PRELIMINARY STUDY OF ACCUMULATION AND TRANSFORMATION OF DDT-14C BY THE POLYCHAETE NEREIS DIVERSICOLOR. (GERMAN: STOFFWECHSEL VON PESTICIDEN IN MARINEN ORGANISMEN I VORLAVFIGE UNTER SUCHUNGEN UBER DIE VMWANDLUNG UND AKKUM VIATION VON DDT-14C DVRCH DEN POLYCHAETEN NEREIS DIVERSICOLOR,
W. Ernst.
English summary. Veroeffentlichungen des Instituts fuer Meeresforschung in Bremerhaven, Vol 11, p 327-332, 1969. 2 tab, 4 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Food chains, *Pesticide removal, *Absorption, *Water pollution effects, *Path of pollutants, *Radioisotopes, *Carbon radioisotopes, *Tracers, *Worms, *Annelids, *Animal metabolism, Pesticide kinetics, Pesticide removal, Pesticide toxicity, Bioassay, Persistence, Pesticides, Environmental effects, Tracking techniques, Halogenated pesticides, Pollutants, Organic pesticides.
Identifiers: *DDA, *Nereis sp., *Polychaetes, DDD, DDE, Concentration.

Following oral application of ug-amounts of DDT to Nereis diversicolor the DDT molecule is metabolized only to a very small degree to presumably DDA and other unidentified components. The main bulk of the DDT is excreted unchanged and is stored unchanged in the range of 51-67% of the initial dose. Uptake from solutions of 0.0003-0.003 ppm shows accumulation concentration factors up to 2000 within five days. Accumulation concentration factors in short-term experiments at 0.03 ppm were 180 to 490 from 2 to 24 hr after application. (LeGore-Washington)
W71-10558

PRELIMINARY STUDIES ON THE TOLERANCE OF AQUATIC INSECTS TO LOW PH,
National Water Quality Lab., Duluth, Minn.
Henry L. Bell, and Alan V. Nebeker.
Journal of the Kansas Entomological Society, Vol 42, No 2, p 230-236, April 1969. 2 fig, 2 tab, 10 ref.

Descriptors: *Hydrogen ion concentration, *Lethal limit, *Bioassay, *Aquatic insects, *Water pollution effects, Bioindicators, Insects, Dragonflies, Stoneflies, Mayflies, Caddisflies, Fish food organisms, Acidity, Water quality, Aquatic environment, Water properties, Mortality, Biology, Toxicity.

The mature larvae of ten species of aquatic insects (dragonflies--Boyeria vinosa, Ophiogomphus rupinsulensis; stoneflies--Pteronarcys dorsata, Taeniopetryx maura, Acroneuria lycorias, Isogenus frontalis; mayflies--Ephemerella subvaria, Stenonema rubrum; and caddisflies--Brachycentrus americanus, Hydropsyche betteni) were tested in the laboratory in continuous flow bioassay to determine their relative tolerance to low pH. The pH at which 50% died after 96 hr was recorded as the lethal pH. These values ranged from pH 4.65 for mayflies to pH 1.50 for caddisflies. (LeGore-Washington)
W71-10559

USE OF FISH BRAIN ACETYLCHOLINESTERASE TO MONITOR POLLUTION BY ORGANOPHOSPHOROUS PESTICIDES,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Biological Lab.
H. Tom Holland, David L. Coppage, and Philip A. Butler.
Bulletin of Environmental Contamination and Toxicology, Vol 2, No 3, p 156-162, 1967. 1 tab, 7 ref.

Descriptors: *Pesticides, *Organophosphorous pesticides, *Inhibition, *Inhibitors, *Monitoring, *Analytical techniques, *Bioassay, *Bioindicators, Agricultural chemicals, Pesticide residues, Pesticide toxicity, Toxicity, Fish physiology, Data collections, Chemical analysis, Biochemistry, Pollutant identification, Biology, Water quality, Path of pollutants, Physiological ecology.
Identifiers: *Acetylcholinesterase, Brain, Nerve tissue.

The organophosphorous pesticides are toxic because they inhibit acetylcholinesterase (AChE), which is esstential to nerve conduction. The feasibility was investigated of using this fact to monitor organophosphorous pesticide pollution in estuarine waters. The techniques used are relatively straightforward and could be readily employed by other laboratories at moderate cost. The chief difficulty lies in the mechanics of handling and shipping the required frozen samples. (LeGore-Washington)
W71-10560

DESTRUCTIVE EFFECTS OF A LOW PH AND A HIGH CONTENT OF FE-COMPOUNDS ON FISH (IN CZECH),
Prague Agricultural Univ. (Czechoslovakia).
L. Kalal, and J. Napravnik.
English summary. Zivocisna vyroba (Praha), Vol 15, No 3, p 225-232, 1970. 6 fig, 1 tab, 14 ref.

Descriptors: *Hydrogen ion concentration, *Iron, *Iron compounds, *Acidity, *Mixed forests, *Coniferous forests, *Forest soils, *Trout, *Fish establishment, Metals, Soil chemical properties, Water chemistry, Water properties, Water pollution effects, Trees, Vegetation, Peat, Granites, Fish conservation, Fish management, Fish physiology, Environmental effects, Fish stocking, Aquatic environment, Aquatic habitats.
Identifiers: Spruce forests, Czechoslovakia.

In the upper course of the River Jizera, high water causes the pH to decrease even to 3.2 and the content of iron compounds to reach a value of 5.3 mg/c. This is a result of eluviations from spruce forests, of a granite base and of the flow-off from peat bogs. In the period of great fluctuation of water level and rate of flow from April to the middle of June, 1967, all species of released fish died within ten days. In June and July the water level, rate of flow, and consequently the pH and the content of iron reached a state of relative balance in which several experimental fish survived to the end of the experiment in August. A laboratory experiment demonstrated and corroborated field observations. It was also demonstrated that trout reared under favorable pH conditions (ca. 7.0) can hardly survive when acidity is instantly increased to pH 5.5. To achieve a successful stocking of this area, the pure spruce stand must be gradually replaced with mixed forest, and resistant stocks of trout, reared in this region, should be used. (LeGore-Washington)
W71-10561

WATER POLLUTION: DEPOSITS OF SUBSTANCES DELETERIOUS TO FISH.
For primary bibliographic entry see Field 06E.
W71-10562

AN AIR-ECONOMIZER APPARATUS FOR USE IN FISH WORK,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05A.
W71-10563

FISH SPECIES DIVERSITY INDICES AS INDICATORS OF POLLUTION IN GALVESTON BAY, TEXAS,
North Carolina State Univ., Raliegh. Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W71-10564

A RECIRCULATING SEAWATER AQUARIUM SYSTEM FOR INLAND LABORATORIES,
Oregon Univ., Eugene.
For primary bibliographic entry see Field 09C.
W71-10565

PESTICIDE EFFECT OF GROWTH AND C-14 ASSIMILATION IN A FRESHWATER ALGA,
Missouri Univ., Columbia. Div. of Biology; and Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
Lelyn Stadnyk, Robert S. Campbell, and B. Thomas Johnson.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 1, p 1-8, 1971. 1 fig, 1 tab, 16 ref.

Descriptors: *Pesticides, *Chlorinated hydrocarbon pesticides, *Carbamate pesticides, *Organophosphorous pesticides, *2-4-D, *DDT, *Dieldrin, *Diazinon, *Water pollution effects, *Photosynthesis, Pesticide toxicity, Plant growth regulators, Inhibition, Inhibitors, Phytoplankton, Phyto-toxicity, Herbicides, Insecticides, Biomass, Productivity, Scenedesmus, Algal.
Identifiers: *Diuron, *Carbaryl, *Toxaphene.

The effects were evaluated of pesticides (diuron, carbaryl, 2,4-D, DDT, dieldrin, toxaphene, and diazinon) on low density populations of the freshwater alga, Scenedesmus quadricaudata, in terms of changes in growth and metabolism rather than death. Of the compounds tested, the soil sterilant and herbicide diuron was the most toxic to the algal population, although apparent bacterial detoxification of this substance was indicated. While DDT, toxaphene and dieldrin generally caused a decrease in cell number, biomass and carbon assimilation, carbaryl and diazinon either had no effect or stimulated carbon fixation and cell division. Long term chronic effects of pesticides in terms of plant life as well as animal species must be considered. (LeGore-Washington)
W71-10566

CHRONIC EXPOSURE OF OYSTERS TO DDT, TOXAPHENE AND PARATHION,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.

Jack I. Lowe, Paul D. Wilson, Alan J. Rick, and Alfred J. Wilson Jr.
Proceedings of the National Shellfisheries Association, Vol 61, p 71-79, June, 1971. 2 fig, 4 tab, 10 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Oysters, *Water pollution effects, *Growth rates, Pesticide residues, Environmental sanitation, Persistance, Self-purification, Public health, Physiological ecology, Animal physiology, Environmental effects, Toxicity, Water quality, Aquatic environment, Mollusks, Shellfish, Bioassay, Juvenile growth stage.
Identifiers: *Parathion, *Toxaphene, *Crassostrea sp., Depuration, Physiological effects, Invertebrate pathology.

Oysters (Crassostrea virginica were reared from juveniles to sexual maturity in flowing seawater chronically polluted with low levels (3.0 ppb or less) of DDT, toxaphene and parathion. The study was performed in two phases over a period of two years, the insecticides being administered as a mixture during the first phase and separately in the second phase of the experiment. The weights of oysters grown in a mixture (1.0 ppb each) of the three insectides were about 10% less than control oysters after 9 months. Weights and heights of separate groups of oysters reared in seawater containing about 1.0 ppb of either DDT, toxaphene or parathion were not statistically different from controls. Oysters reared in the pesticide mixture exhibited tissue changes in the kidney, visceral ganglion, gills, digestive tubules and tissues beneath the gut. A mycelial fungus was also present, indicating a breakdown in the oysters' natural defense against this parasite. Eggs and spermatozoa removed from the oysters developed into 24 hr trochophore larvae. The oysters accumulated relatively high levels of DDT and toxaphene, but eliminated them during a 3 month depuration period. (LeGore-Washington)
W71-10567

ORGANOCHLORINE PESTICIDES IN SEALS AND PORPOISES,
Freshwater Fisheries Lab., Pitlochry (Scotland).
A. V. Holden, and K. Marsden.
Nature, Vol 216, No 5122, p 1274-1276, Dec. 30, 1967. 4 tab, 15 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *Dieldrin, *Pesticide residues, *Pesticide kinetics, *Food chains, *Path of pollutants, *Chromatography, Agricultural chemicals, Absorption, Bioassay, Hazards, Pesticide drift, Pollutants, Pesticide toxicity, Distribution patterns, Analytical techniques.
Identifiers: *Porpoises, *Seals, Gas-liquid chromatography, Halichoerus sp., Phoca sp., Phocaena sp.

Organochlorine residues have been found in fatty tissues of aquatic animals throughout the world. The wide occurrence of these compounds is coroborated. Grey seals (Halichoerus grypus), common seals (Phoca vitulina), and porpoises (Phocaena phocaena) from Scottish coasts, and harp seals (Phoca groenlandica) from the Canadian Atlantic coast were examined for chlorinated hydrocarbon residues. The principle pesticide residues found in all samples examined were those of the DDT group, with dieldrin in much smaller quantities. While the residue concentrations in subcutaneous fat are high, those of other tissues are much lower, suggesting that there is little risk of physiological effect, except perhaps during periods of metabolic stress. (LeGore-Washington)
W71-10568

TOXICITY OF CHLORCHOLINCHLORIDE TO FISH (IN CZECH),
Vyzkumny Ustav Rybarsky a Hydrobilogicky Vodnany, Prague (Czechoslovakia).
Z. Svobodova.
English summary. Bulletin VUR Vodnany, Vol 7, No 2, p 37-40, 1971. 2 tab, 6 ref.

Descriptors: *Agricultural chemicals, *Plant growth regulators, *Water pollution effects, *Carp, *Perches, *Lethal limit, Chemcontrol, Water pollution sources, Bioassay, Pollutants, Toxicity, Water quality, Fish physiology, Fish concervation, Fish diseases, Effects, Fiskill.
Identifiers: *CCC, *Chlocholinchloride, *Chlorocholine chloride.

Preparations of 60% chlorcholinchloride (CCC) are used on Czechoslovakian produce, and 75% preparations of CCC-Stabilan are used on Austrian produce. The effects of these preparations on carp fry (Cyprinus carpio) and perch (Perca fluviatilis) were examined. The lethal dose of CCC-60% is 7500 ppm for carp fry and 1000 ppm for perch. The LD-50 for carp fry is 5000 ppm and is 1000 ppm for perch. First symptoms of intoxication were noted in carp exposed to 3000 ppm and in perch exposed to 500 ppm. The lethal dose of CCC-Stabilan-75% is 5000 ppm for carp fry, and 1000 ppm for perch. First symptoms are again noted at 3000 ppm for carp and at 500 ppm for perch. The course of intoxication is gradual in carp fry, without loss of balance. In perch, however, onset of intoxication is pronounced, with frequent loss of balance. Pathological and anatomical observations are not specific for CCC poisoning. Excessive blood supply can be observed in the body cavity, and, in perch, a slightly cyanotic gill coloring has been observed. (LeGore-Washington)
W71-10569

A SURVEY OF THE MUSSELS (UNIONACEA) OF THE ILLINOIS RIVER: A POLLUTED STREAM,
Illinois Dept. of Registration and Education, Urbana. Natural History Survey Div.
William C. Starrett.
Illinois Natural History Survey Bulletin, Vol 30, Article 5, Feb 1971. 403 p, 17 fig, 48 tab, 4 color plates, 71 ref. Bureau of Commercial Fisheries grant; Ill. Dept. of Conservation; and Ill. Natural History Survey.

Descriptors: *Illinois, *Mussels, *Water pollution effects, Surveys, Mollusks, Shellfish, Animal populations, Aquatic populations, Distribution patterns, Environmental effects, Water pollution sources, Productivity, Standing crop, Wildlife conservation, Conservation, Fisheries, Evaluation, On-site data collections.
Identifiers: *Illinois River, *Population estimates, Molluscan fisheries.

The purposes were to make a survey of the pearly mussel (Mollusca: Pelecypoda: Unionacea) populations of the entire Illinois River, and to determine what species and distributional changes have taken place during the last century. As background, the river setting, dams and navigation pools, current speeds, bottom soils, turbidity, pollution, and water chemistry are discussed. Species occurrence and museum records are summarized. Effects of water pollution on mussel populations are discussed at length. The author concludes that during the past 75 years the Illinois River has changed from an excellent mussel stream to a poor one, and that the major factors involved have been domestic, industrial and agricultural pollution. Conservation and management policies are discussed. (LeGore-Washington)
W71-10571

A SURVEY OF SOME PHYSIOLOGICAL CHARACTERISTICS OF STREAM-BORNE BACTERIA,
Birmingham Univ. (England). Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W71-10578

BIOLOGY OF CLADOPHORA IN FRESHWATERS,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
Water Research, Vol 4, No 7, p 457-476, July 1970. 20 p, 1 tab, 80 ref.

Descriptors: *Eutrophication, *Algae, *Surface waters, *Reviews, *Water pollution sources, Nutrients, Plant physiology, Lakes, Ponds, Aquatic algae, Ecology, Biological properties, Fresh water, Water quality.
Identifiers: *Cladophora.

The literature on Cladophora growing in freshwaters is summarized, especially those situations where nutrient enrichment by mad has led to the presence of conspicuous and sometimes troublesome growths. It is reasonable to assume that Cladophora played a relatively minor role in aquatic communities before the activities of man led to widespread nutrient enrichment. Massive growths probably could not develop in flowing waters without man's activities. Therefore, it is possible that the algae itself may be undergoing evolutionary changes in response to these new environments. Cladophora as a genus is favored by high light intensities, high water turbulence, high nutrient levels, high pH values, hard waters. Not all species share all these characters, but C. glomerata, the species which has increased the most as a response of man's activities, is the organism which combines all these characters within a single species. (Woodard-USGS)
W71-10580

EFFECT OF IRRIGATION ON THE SALT REGIME OF TERRACED CHERNOZEMS OF THE TRANS-VOLGA REGION (Vliyaniye orosheniya na solevoy rezhim terrasovykh Chernozemov Zavolzh'ya),
Kuybyshev Agricultural Inst. (USSR).
M. M. Razumova.
Pochvovedeniye (Soil Science), No 11, p 74-85, November 1970. 12 p, 1 fig, 8 tab, 16 ref.

Descriptors: *Irrigation, *Land reclamation, *Salinity, *Groundwater, *Chernozems, Salts, Salt balance, Water table, Water chemistry, Irrigation water, Water quality, Alkalinity.
Identifiers: *USSR, Kuybyshev Oblast.

Irrigation in the Kutuluk irrigated tract of the Kuybyshev Oblast between 1964 and 1968 has resulted in a rise in groundwater level. A groundwater rise above the critical level (2 m below ground surface) leads to secondary salinization (sulfate calcium-magnesium with sodium carbonate), accompanied by an accumulation of toxic amounts of salt (0.8-0.9%) in the root zone and by a change in the composition of absorbed bases. Dynamic changes are observed in the colloidal complex as a result of the formation and accumulation of water-soluble humus. Subsequent desalinization, produced by a drop in groundwater level, has failed to restore the Chernozems to their initial state. A rise in groundwater level to within 2.5-3 m of ground surface produces a less pronounced change; least change is observed when the groundwater remains below 3 m. (Josefson-USGS)
W71-10598

THE UNITED KINGDOM APPROACH TO THE APPLICATION OF ICRP STANDARDS TO THE CONTROLLED DISPOSAL OF RADIOACTIVE WASTE RESULTING FROM NUCLEAR POWER PROGRAMS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England), Fisheries Radiobiological Lab.
A. Preston.
Availability: Unipub, Inc., P.O. Box 433, New York, N.Y. 10016. Proceedings of IAEA-SM-146-9, Aug. 1970, p 147-57, 3 fig, 4 tab.

Descriptors: *Effluents, *Radioactivity, *Nuclear power plants, *Waste treatment, *Waste disposal, *Control, Standards, Regulation, Safety, Population, Aquatic population, Environment, Evaluation, Path of pollutants.
Identifiers: Codes and Standards, Radiation Safety and Control, United Kingdom.

United Kingdom policy is outlined for the routine control of radioactive effluents originating from a nuclear power program and by using specific examples, how the ICRP recommended standards are applied to the controlled release of radioactive waste material to the environment is shown. The practical application of basic does criteria to diverse environmental situations necessitates a quantitative evaluation of the possible exposure pathways in each situation, and in some cases the identification of a critical population group, before recommended limits expressed in terms of dose can be applied. Final authorizations for waste disposal, while always subject to the absolute limitations of safety, are also carefully related to justifiable operational needs. (Houser-NSIC)
W71-10607

COEFFICIENTS OF ACCUMULATION OF STRONTIUM-90 BY LIVE AND DEAD MARINE PLANTS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
D. D. Baranova-Ryndina, and G. G. Polikarpov.
Available from NTIS. AEC-tr-7026, p 200-204; 2 tab, 3 ref, Radiobiologiya, Vol. 9, No. 3, p 468-472, 1969.

Descriptors: *Strontium radioisotopes, *Marine plants, Phaeophyta, Chlorophyta, Rhodophyta, Detritus, Absorption, Water pollution effects, Aquaria, Biological properties.

High strontium-90 uptake is shown by both living and dead brown algae. During decomposition, radiostrontium is released. Relatively low uptake is shown by living and dead green and red algae and flowering plants, as well as by their detritus. It appears that uptake is related to characteristics of the organisms which are preserved for some time in dead organisms. (Bopp-NSIC)
W71-10615

ARTIFICIAL RADIOACTIVITY OF GRAY WHALES,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
N. V. Sokolova.
Available from NTIS. AEC-tr-7136, p 135-138, 1 fig, 2 tab, 1 ref. Radiobiologiya, Vol. 9, No. 5, p 748-750, 1969.

Descriptors: *Strontium radioisotopes, *Marine animals, Oceans, Fallout, Water pollution effects, Absorption.
Identifiers: *Cesium radioisotopes, *Whales.

As a result of investigations conducted in 1966, the presence of artificial long-lived radioisotopes, strontium-90 and cesium-137, was detected in the tissues of gray whales. The radiostrontium content in the bones was 13.7-43.4 pCi/kg of crude weight. The radiocesium content in muscles, liver, skin, and contents of the stomach was 39.1 to 125.4 pCi/kg. (Bopp-NSIC)
W71-10616

ION SCAVENGING BY THE EASTERN CLAM AND QUAHOG,
Sea Farm Research Foundation, Waltham, Mass.
Howard L. Andrews, and Shields Warren.
Health Physics, Vol. 17, p 807-810 (1969). 3 fig, 2 tab, 13 ref.

Descriptors: *Iodine radioisotopes, *Strontium radioisotopes, *Clams, Absorption, Sea water, Sedimentation rates, Cycling nutrients, Trace elements, Water pollution control, Water pollution effects.
Identifiers: *Iron radioisotopes.

The depletion of iodine-131, strontium-85, and iron-59 from sea water by the clam and quahog and their fecal excretion of these several elements was determined. The concentration of these elements in the feces is increased by several orders of magnitude over that in the sea water. This may be an important element in the transfer of nuclides to bottom sediments. (Bopp-NSIC)
W71-10618

RETENTION OF CHROMIUM-51, IRON-59, COBALT-60, ZINC-65, STRONTIUM-85, NIOBIUM-95, INDIUM-141m, AND IODINE-131 BY THE ATLANTIC CROAKER,
Bureau of Commercial Fisheries, Beaufort, N.C. Radiobiological Lab.
J. P. Baptist, D. E. Hoss, and C. W. Lewis.
Health Physics, Vol. 18, p 141-148 (1970). 2 fig, 5 tab, 27 ref.

Descriptors: *Saline water fish, *Radionuclides, Absorption, Water pollution effects, Temperature, Salinity, Public health, Marine fisheries, Cobalt radioisotopes, Zinc radioisotopes, Strontium radioisotopes, Iron radioisotopes.
Identifiers: Chromium radioisotopes, Iron radioisotopes, Niobium radioisotopes, Indium radioisotopes, Atlantic croaker, Micropogon undulatus.

Biological half lives of radionuclides in fish were determined by injecting the radionuclides into the stomach and following the decline in radioactivity. The effect of temperature and salinity was studied. In a preliminary experiment with zinc-65, it was shown that the rate of loss in the radionuclide was the same for administration of the radionuclide in food, in the sea water, or by injection. Biological half lives for the various radionuclides ranged from 0.25 to 6.5 days for the short-lived component to 31 to 465 days for long-lived component. The relative hazard of the various radionuclides is discussed. (Bopp-NSIC)
W71-10619

ECOLOGICAL MODELS APPLIED TO RADIONUCLIDE TRANSFER IN TROPICAL ECOSYSTEMS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 06G.
W71-10620

EVALUATION OF POTENTIAL HAZARDS FROM TRITIATED WATER,
Brookhaven National Lab., Upton, N.Y.
V. P. Bond.
Availability: Unipub, Inc., P.O. Box 433, New York, N.Y. 10016. Proceedings of IAEA-SM-146-13, Aug 1970, p 287-300.

Descriptors: *Evaluation, *Hazards, *Tritium, *Water, *Air pollution, *Water pollution, Path of pollutants, Absorption, Toxicity, Digestion, Nuclear Power Plants, Effluents, Population, Radioactivity effects.
Identifiers: Ingestion, Inhalation, Dose.

The possible biological effects of tritium are analysed, and several factors that must go into an evaluation are considered both from the theoretical and experimental stand-points. Maximum permissible concentrations or maximum permissible doses of tritium are based principally on the absorbed radiation dose delivered by the tritium beta rays. Several possible factors that might increase the degree of toxicity over that expected from the absorbed dose are considered in detail. These include the possibility of biological concentration of tritium, or of additional toxicity by virtue of the fact that some tritium may be incorporated into biological molecules such as DNA. The conclusion is reached that these factors do not significantly increase the 'effective dose' that might be expected from a given concentration of tritium in the environment. A given absorbed dose of radiation from the beta rays of tritium (from either inhalation or ingestion) has the same radiobiological and radiation protection meaning as the given dose from X-rays or gamma rays (same dose rate pattern), and little or no added significance or potential hazard need be attached by virtue of the fact that the dose may have been derived from tritium. The dose to the public from tritium and other isotopes released from nuclear power plants is discussed in relation to the maximum permissible dose to the public from all radiation sources, and in the context of doses received now and in the future from nuclear power plants. (Houser-NSIC)
W71-10632

BIOLOGICAL EFFECTS OF COPPER AND ARSENIC POLLUTION,
Alaska Univ., College, Inst. of Marine Science.
D. K. Button, and S. S. Dunker.
Available from the National Technical Information Service as PB201 648, $3.00 in paper copy, $0.95 in microfiche. Report No. R71-8, April, 1971, 59 p, 8 fig, 4 tab, 11 ref, 2 append. EPA Contract No. 18050 DLW.

Descriptors: *Water pollution effects, *Toxicity, Marine microorganisms, *Copper, Arsenic compounds, *Phosphates, Manganese, Metabolism, Growth rates, Lethal limit, Microenvironment, Nutrients, Trace elements, Microbiology, Yeasts, Alaska.
Identifiers: *Arsenate, Trace metals, *Antimetabolities, Phosphate assimulation, Marine yeast.

Inhibitory effects of copper toward marine microorganisms were studied. Phosphate was found to prevent copper inhibition. An organism capable of metabolism at low phosphate concentrations was selected; growth and phosphate flux kinetics were described. These phosphate limited systems were found to be copper sensitive only under conditions of manganese deficiency. Toxicity occurred in this normally rather resistant yeast and in hydrocarbon oxidizing microorganisms at about 0.000001 M. The protective influence in reagent grade phosphate was traced to its usual contamination with trace amounts of manganese. Arsenate was among a number of metabolic inhibitors found to inhibit phosphate transport; phosphate also competitively reduced arsenate uptake. Reduced phosphate uptake rates occurred at 0.000001 M arsenate and high death rates in cultures otherwise sustaining normal growth rates were induced with 0.0000001 to 0.00000001 M arsenate in phosphate deficient systems. These levels are exceeded in environmental and potable water systems. Both arsenate and phosphate are accumulated by the same active transport system in which velocities increase as the hydrogen ion is increased, saturation of the system does not occur, and the transport temperature coefficient is very large. Both arsenate and copper are important at existing concentrations in the environment. When nutrients are dilute these antimetabolites prevent microbial metabolism thus affecting the steady state chemistry which they control. Toxicity levels of antimetabolites depend not only on populations and chelate concentrations but in a major way on free nutrients and trace metal levels.
W71-10637

TOXIC ACTION OF WATER SOLUBLE POLLUTANTS ON FRESHWATER FISH,
Michigan State Univ., Lansing. Dept. of Physiology.
Paul O. Fromm.
Copy available from GPO Sup Doc EPA-WQO Programs 18050DST paper copy, $0.65; microfiche from NTIS as PB-201 650. $0.95. Water Pollution Control Research Series, December 1970, 56 p, 11 fig, 11 tab, 30 ref.

Descriptors: *Fish, Chromium, *Insecticides, Ammonia, Sodium, Nitrogen, Fish physiology,

*Toxicity, *Trout, Dieldrin, Rotenone, *Rainbow trout.
Identifiers: Nitrogen excretion, *Goldfish, Malathion, MS-222, Sodium transport, Methoxychlor, Gill fluid flow, Planning (Fish).

Over a five year period experiments on rainbow trout indicated that exposure to chromium and to forced exercise caused a transient increase in plasma cortisol. Exposure to ammonia (a) caused a decrease in the rate of total nitrogen excretion and in ammonia excretion (b) caused some histopathological changes in trout gills but oxygen transport by hemoglobin was unaffected (c) caused a very slight increase in urea excretion by trout but a very significant rise in goldfish. Hyperexcitability observed in ammonia-exposed trout was not noticeable in the more resistant goldfish. Ammonia may kill fish by prevention of excretion of normal amounts of endogenous ammonia. Experiments with isolated-perfused gills of trout have shown among other things that (a) gill blood flow patterns are significantly affected by epinephrine (b) when perfused with Ringer solution there was a small but significant loss of sodium into the bath solution, whereas perfusion with sodium-poor Ringer solutions always resulted in a net uptake of sodium (c) perfusion fluid sodium and epinephrine appear to control sodium uptake by the gill (d) transfer of dieldrin into the vascular system occurred only when plasma protein, or more probably plasma lipoprotein was present in the perfusion fluid (e) short term exposure to dieldrin, rotenone, malathion and MS-222 reduced perfusion flow rate through isolated gills but exposure to 1 mg/L methoxychlor was without effect. Decrease in flow rate correlated well with lamellar perfusion.
W71-10639

NUTRITIONAL ECOLOGY AND COMMUNITY STRUCTURE OF THE PHYTOPLANKTON OF GREEN BAY,
Wisconsin Univ., Madison. Water Resources Center.
Paul E. Sager.
Available from the National Technical Invormation Service as PB-201 696, $3.00 in paper copy, $0.95 in microfiche. Technical Completion Report, Water Resources Center, The University of Wisconsin-Madison, Wisconsin, 1971, 31 p, 7 fig, 11 tab, 21 ref, OWRR Project A-017-WIS (1).

Descriptors: *Phytoplankton, *Aquatic algae, *Phosphorus, *Cyanophyta, *Eutrophication, Biomass, Water quality, Chlorophyll, Nitrogen, Wisconsin, Nutrients, Water pollution effects, Interfaces, Dissolved oxygen, Temperature, Organophosphorous compounds, Algae.
Identifiers: Green Bay, Fox River, Specific conductance, Transparency, Orthophosphates, Dry weight, Phosphate uptake.

The influence of the Fox River on certain chemical and physical parameters of water quality in lower Green Bay has been studied with respect to responses in the structure and phosphorus nutrition of the phytoplankton community. Secchi disc transparency, dissolved oxygen, specific conductance, temperature, orthophosphate, nitrate, chlorophyll a, phytoplankton dry weight, and extractable phosphate (luxury uptake by algae) were analyzed weekly at nine stations along a transect running 13.5 miles up the Bay from the mouth of the Fox River. The existence of two water masses can be observed in the lower Bay, one characterized by Fox River parameters and the other representing the Bay water. The diffuse interface between the two masses can be located in the vicinity of Long Tail Point, approximately five miles from the mouth of the river. In the extreme lower Bay, the phytoplankton, dominated by river algal species, exhibit high biomass and low luxury uptake of orthophosphate in the presence of low concentrations of available phosphate.
W71-10645

THE EFFECTS OF EXTREME FLOODS AND PLACER MINING ON THE BASIC PRODUCTIVITY OF SUB-ARTIC STREAMS,
Alaska Univ., College. Inst. of Water Resources.
James E. Morrow.
Available from the National Technical Information Service as PB-201 654, $3.00 in paper copy, $0.95 in microfiche. Institute of Water Resources, University of Alaska, College, Publication IWR-14, 1971, 8 p, 1 fig, 2 tab, 2 ref. OWRR Project A-027-ALAS (1).

Descriptors: *Floods, Flood damage, *Water quality, Dissolved oxygen, Hydrogen ion concentrations, *Productivity, Animals, Plants, Primary productivity, Mine wastes, Turbidity, Fish, Alaska, Subartic, Streams, Water pollution effects, Environmental effects.
Identifiers: McManus Creek (Alas), Faith Creek (Alas), Graylings.

The primary purpose was to establish whether or not mining activity or flooding would affect levels of vegetation and animal life in a sub-artic stream. The majority of samples taken were in riffle areas, not throughout the whole stream system. Small mining operations do not appear to adversely affect the fauna. Additionally, extreme flooding (Fairbanks, Alaska - August 1967) does not seem to have destroyed bottom dwelling organisms, as the levels in 1968 indicated complete recovery. However, there is every indication that parameters such as pH, DO, temperature, and basic productivity as it relates to these, would be definitely changed when exposed to a large scale operation or high organic overburden. (See also W71-10649) (Barclay-Alaska)
W71-10648

THE EFFECTS OF WATER QUALITY AND QUANTITY ON THE FAUNA OF A NON-GLACIAL ALASKAN RIVER,
Alaska Univ., College. Inst. of Water Resources.
James E. Morrow.
Available from the National Technical Information Service as PB-201 655, $3.00 in paper copy, $0.95 in microfiche. Institute of Water Resources, University of Alaska, College, Publication IWR-15, 1971, 20 p, 1 fig, 7 tab, 6 ref.

Descriptors: *Water quality, Water quantity, *Dams, *Alaska, Fish migration, Animals, Fish, Water pollution effects, Environmental effects.
Identifiers: Non-glacial river, *Thymallus articus (Arctic grayling).

This report was on a study of the effects of a man-made dam on the migration of Thymallus arcticus, the Arctic grayling. It also kept records of water quality in two streams, which were tributaries of the Chatanika River, Faith Creek and McManus Creek. Growth of these fish was not significantly less nor larger than those found further downstream. Bottom fauna in these two areas was significantly reduced during minor and major flooding, in fact were completely washed away. Populations made recovery however. The only significant or outstanding data relative to the water chemistry was the high nitrate-nitrogen rate. (See also W71-10648) (Barclay-Alaska)
W71-10649

HANDBOOK OF TOXICITY OF PESTICIDES TO WILDLIFE,
Bureau of Sport Fisheries and Wildlife, Denver, Colo. Denver Wildlife Research Center.
Richard K. Tucker, and Glen D. Crabtree.
Available from the National Technical Information Service as PB-198 815, $3.00 in paper copy, $0.95 in microfiche. Bureau Resource Publication no. 84, June 1970, 131p.

Descriptors: Water pollution sources, *Pesticides, *Toxicity, *Wild life, Insecticides, Herbicides, Fungicides, Water pollution effects.
Identifiers: *Toxicology, Organic phosphates, Chlorine organic compounds.

This handbook was written to fill a long-standing need for a compendium of pesticide toxicity data for wildlife species that will provide, if not final answers, at least a basis for comparison of one pesticide with another. The chemicals chosen for testing include 108 pesticides used in thousands of formulations. GENERALLY THEY ARE THE PESTICIDES TO WHICH WILDLIFE ARE EITHER MOST OFTEN EXPOSED OR MOST SUSCEPTICLE. Toxicity studies were conducted upon 30 common wildlife species such as mallard ducks, ring-necked pheasants, house sparrows, bobwhite quail, common bullfrogs, and mule deer. Toxicity information is given separately for each pesticide. The chemicals appear alphabetically and are cross-indexed by common, trade, and chemical names. The acute oral toxicity values given include information on species, sex, age, symptoms, and additional information on subacute and reproductive tests for many of the pesticides.
W71-10670

MEASURES OF THE POTENTIAL ECONOMIC LOSS FROM OIL POLLUTION,
Center for Naval Analyses, Arlington, Va.
For primary bibliographic entry see Field 05G.
W71-10673

WATER POLLUTION FROM EROSION.
Defense Documentation Center, Alexandria, Va.
10A
Available from the National Technical Information Service as AD-722 960, $3.00 in paper copy, $0.95 in microfiche. DDC Bibliography - TAS-71-11, May 1971, 138p. 88 refs.

Descriptors: *Bibliographies, *Erosion, *Water pollution, *Sedimentation, Soils, Estuaries, Harbors, Rivers, Lakes, Inland waterways, Floods, Industrial wastes, Sewage, Sanitary engineering.
Identifiers: Radioactive fallout.

This bibliography consists of references to reports on the presumably damaging deposition of earth materials in water. Soil sediments are considered to be pollutants if they would seem to interfere with the use of water for navigational, recreational, agricultural, biological, or ecological functions. The entries were selected from references to unclassified and unlimited reports processed into the AD data bank from January 1953 through December 1970. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number Indexes are provided.
W71-10674

A PROCEDURE FOR EVALUATING ENVIRONMENTAL IMPACT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06G.
W71-10688

A REVIEW OF THE 1970 LITERATURE ON WASTE WATER AND WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 05G.
W71-10691

ECOLOGICAL EFFECTS OF OIL POLLUTION,
W. L. Templeton.
Journal Water Pollution Control Federation, Vol 43, No 6, p 1081-1088, Jun 1971. 8 p, 56 ref.

Descriptors: *Reviews, *Water pollution effects, *Water pollution treatment, *Oily water, *Toxicity, *Environmental effects, Wildlife, Poisons, Ships, Water pollution sources, Oil wastes, Bibliographies, Ecology.
Identifiers: *Oil spills, *Oil spill effects.

Review of the nature and scope of the oil spill problem indicates that, during the period 1956 to 1969, 75 percent of the major oil spill indicents were associated with vessels, principally tankers, 80 percent occurred within 10 miles off shore, and

90 percent involved crude or residual oils. Intensive efforts are being made to combat oil spills by mechanical and physical pick up; by treatment with dispersants, absorbents, gelling agents, combustion promoters, and sinking agents; and by enhancing biodegradation. Detergents used during the Torrey Canyon incident provoked a controversy over the use of oil-dispersing chemicals which persists today. This concern for environmental effects has resulted in a reappraisal of the performance of these chemicals as dispersants in relationship to the toxicity of oil itself and as an oil-dispersant mixture. (See also W71-10691) (Knapp-USGS)
W71-10696

ACCUMULATION OF MERCURY AND ITS COMPOUNDS,
For primary bibliographic entry see Field 05B.
W71-10697

TRACE METALS: UNKNOWN, UNSEEN POLLUTION THREAT.
For primary bibliographic entry see Field 05B.
W71-10705

PRELIMINARY EVALUATION OF CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05A.
W71-10736

EVALUATION OF CURRENT TECHNIQUE FOR NUTRIENTS REMOVAL FROM WASTE WATERS,
Mississippi State Univ., State College. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W71-10761

BIOLOGICAL PROBLEMS IN WATER POLLUTION,
Robert A Taft Sanitary Engineering Center, Cincinnati, Ohio.
Clarence M. Tarzwell.
Available from the National Technical Information Service as PB-196 627, $3.00 in paper copy, $0.95 in microfiche. Transactions, Seminar on Biological Problems in Water pollution, Taft Engineering Center, Apr 23-25, 1956. 272 p.

Descriptors: *Water pollution, *Aquatic biology, *Bioindicators, *Bioassay, Toxicity, Aquatic mammals, Algae, Fish, Diatoms, Fungi, Insects, Bacteria, Protozoa, Sewage, Lakes, Nutrients.
Identifiers: *Indicator species, Microorganisms, Fresh water biology, Suspended sediments, Marine biology, Stream pollution, *Water pollution detection.

Biologists engaged in pollution investigations and research often work alone and are somewhat isolated. For some time, therefore, there had been recognized a need for a conference of those engaged in the study of biological problems in water pollution control, to acquaint them with current developments and new methods of approach, and to enable them to become acquainted with other workers in the field. The first such gathering was held as a seminar at the Robert A. Taft Sanitary Engineering Center, April 23 - 27, 1956. The seminar consisted of panel discussions and was planned so that most of the time was devoted to commentary from the floor with only short presentations by panel members. Subjects discussed were (1) Use and Value of Bioassays; (2) Use and Value of Biological Indicators of Pollution; (3) Current Investigations in Water Pollution Biology; (4) Water Quality Criteria for Aquatic Life; and (5) Training of Sanitary Aquatic Biologists.
W71-10786

THE DEPENDENCE OF PRIMARY PRODUCTION ON THE COMPOSITION OF PHYTOPLANKTON (ZAVISIMOST PERVICHNOI PRODUKTSH OT SOSTAVA FITOPLANKTONA),
Naval Oceanographic Office Washington, D.C.
I. L. Pyrina.
Available from the National Technical Information Service as AD-718 176, $3.00 in paper copy, $0.95 in microfiche. Naval Oceanographic translation 201, 1963. Translation: Pervichnaya Produktsiya Moray i vnutvennikh, p 308-313, 1961.

Descriptors: *Plankton, *Photosynthesis, Phytoplankton, Algae, Temperature, Solar radiation.
Identifiers: Marine biology, *Primary biological productivity.

The dependence of primary production on the composition of phytoplankton is based on special observations carried out in the summer of 1958 in the Ivan'kovskoye, Rybinskoye and Kuybyshevskoya water basins, as well as in certain sectors of the Volga River. In addition to the primary production, the species' composition and the biomass of phytoplankton was determined, the energy of solar light striking the water surface, the temperature and transparency of water. The instruments and methods used are briefly described, illustrating graphically the variations of photosynthesis in various algal groups and the utilization of light energy by various phytoplankton species in the above-mentioned water basins.
W71-10788

COPEPODS AND NEEDLEFISHES: A STUDY IN HOST-PARASITE RELATIONSHIPS,
Bureau of Commercial Fisheries, Washington, D.C. Systematics Lab.
Roger F. Cressey, and Bruce B. Collette.
Available from the National Technical Information Service as COM-71-00278, $3.00 in paper copy, $0.95 in microfiche. Fishery bulletin, Vol 68, No 3, p347-432, November 1970.

Descriptors: *Crustaceans, *Fish, *Parasitism, *Systematics, Hosts, *Copepods.
Identifiers: *Marine biology, *Host parasite relations, *Needlefishes, Belonidae, *Copepoda.

A survey of museum material of the species of needlefishes (Belonidae) found 3,863 copepods of 31 species from 25 species of needlefishes. Tselve species of copepods are described as new. Eight additional species were not named or described in detail because of insufficient material. The copepod fauna of each species of needlefish is listed separately after the toxonomic descriptions of the copepods. Eight questions regarding needlefishes and their copepod parasites are considered: Host specificity; Distributions; Intraspecific variations of copepods; Relative evolutionary rates; Effect of host size; Competition between copepods; Variation in infestation in time and spare; Nature of the symiotic relationship.
W71-10790

EFFECTS OF HYDROSTATIC PRESSURE ON PHOTOSYNTHESIS AND GROWTH OF UNICELLULAR MARINE ALGAE AND DIATOMS,
Hawaii Univ., Honolulu. Dept. of Microbiology.
Leslie Ralph Berger.
Available from the National Technical Information Service as AD-720 401, $3.00 in paper copy, $0.95 in microfiche. ONR Progress report, Apr 1971. 11 p. ONR Project No 306820.

Descriptors: *Algae, *Photosynthetic oxygen, *Photosynthesis, Instrumentation, Hydrostatic pressure, Diatoms.
Identifiers: Growth, Oxygen, Monitors.

Light-dependent oxygen production and growth of algal cultures have been measured at 25C at various light intensities and hydrostatic pressures. A device which maintains a desired concentration of dissolved oxygen during growth and oxygen evolution by photosynthetic organisms is described. The system uses a modified rate-measuring oxygen electrode system in conjunction with an oxygen concentration monitoring unit.
W71-10791

RESIDUES IN FISH WILDLIFE, AND ESTUARIES: ORGANOCHLORINE PESTICIDES IN NURSING FUR SEAL PUPS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Biological Lab.
Raymond E. Anas, and Alfred J. Wilson, Jr.
Available from the National Technical Information Service as COM-71-00297, $3.00 in paper copy, $0.95 in microfiche. Pesticides Monitoring Journal, Vol 4, No 3, p 114-116, December 1970.

Descriptors: *Pesticides, *Fish, *Organic pesticides, *Chlorinated hydrocarbon pesticides, Estuaries, Alaska, Mammals, *Pesticide residues, DDT.
Identifiers: *Seals, Wildlife, Chlorine organic compounds, Pribilof Islands, Callorhinus ursinus, DDE.

Samples of muscle, brain, liver, blubber, and ingested milk from five nursing fur seal pups. Callorhinus ursinus, were analyzed for organochlorine pesticides and polychlorinated biphenyl compounds (PCB's). Of 25 samples of tissue and ingested milk, 25 contained DDE; 19, DDD; 22, DDT; and 9 contained dieldrin. All of the samples of ingested milk and tissues, with the exception of brain tissue, contained trace amounts of PCB's. Concentrations of DDE, DDD, and DDT in the liver and brain of 4-month-old nursing pups tended to be higher than those found in 4-month fetuses studied previously.
W71-10792

EFFECT OF ORGANIC PHOSPHORUS INSECTICIDES ON PLANTS AND ANIMALS,
Joint Publications Research Service, Washington, D.C.
V. A. Gofmekler, B. B. Khuriev, E. S. Kosmatyi, and V. N. Kavetskii.
Available from the National Technical Information Service as JPRS-52742, $3.00 in paper copy, $0.95 in microfiche. Translated from Gigenya i Sanitariya, Jan 1971.

Descriptors: *Insecticides, *Toxicity, *Phosphorous compounds, *Organic pesticides, Embryonic growth stage, Chromatography, Plants, Bioassay.
Identifiers: *Embryos, *Phosphorus organic compounds, USSR, Chromatographic analysis, *Trichlorofon, *Demeton, *Phosphorothioates.

Two papers are translated from the Russian: Experimental investigation of the embryotropic effort of methylmercaptophos when inhaled. The chromotographic method of assaying chlorophos residues in plants.
W71-10798

THE MARINE DISPOSAL OF SEWAGE SLUDGE AND DREDGE SPOIL IN THE WATERS OF THE NEW YORK BIGHT,
Woods Hole Oceanographic Institution, Mass.
R. A. Horne, A. J. Mahler, and R. C. Rossello.
Available from the National Technical Information Service as AD-722 791, $3.00 in paper copy, $0.95 in microfiche. Coastal Engineering Research Center Contract report, January 1971. 147 p.

Descriptors: *Sewage disposal, *Sludge disposal, *Water pollution sources, *Water pollution effects, Solid wastes, New York, Ecology, Ocean currents.
Identifiers: *Spoil disposal, *Coastal zone, *New York bight, *Solid waste disposal.

The dumping of sewer sludge and dredge spoil in the waters of the New York Bight and the effect of this waste disposal practice on the marine environ-

ment is reviewed. The quantities and composition of these wastes are described, together with their physical, chemical and biological effects on the environment. At the center of the sludge dump, the bearing capacity of the waters has been exceeded, and an anoxic bottom area devoid of life formed. Both spoil and sludge contain large quantities of toxic heavy metals, and the spoil also contains large quantities of petrochemicals and pesticides.
W71-10800

A STUDY OF BIOLOGICAL COMMUNITIES IN THE SCIOTO RIVER AS INDICES OF WATER QUALITY,
Ohio State Univ., Columbus. Water Resources Center.
John H. Olive.
Available from the National Technical Information Service as PB 201 752, $3.00 in paper copy, $0.95 in microfiche. Report No. 335X, March, 1971. 181 p. 19 fig, 6 tab, 29 ref. OWRR B-008-OHIO (1).

Descriptors: *Surveys, *Data collections, Ohio, *Biological communities, *Ecological distribution, Census, Hydrologic data, On-site data collections, Sampling, Water pollution effects, Bioindicators, Biogeography, Ecotypes.
Identifiers: *Scioto River (Ohio), Base-line data.

The objectives were: to evaluate the quality of the surface water of Ohio's Scioto River system in relation to biological community-structure parameters; to prepare an inventory of benthic macroinvertebrates and diatoms in the system as a base-line for measuring future changes in water quality. The topography, geology, climate, soils, land use, water supply and use, and pollution of the system's watershed are discussed. Quantitative biological samples were taken at 76 stations, and chemical and physical parameters were measured. The bulk of the report is devoted to graphical and tabular presentation of the data. (LeGore-Washington)
W71-10898

WATER QUALITY CONTROL AT LAKE TAHOE: DISSERTATION ON GRASSHOPPER SOUP,
For primary bibliographic entry see Field 05G.
W71-10906

5D. Waste Treatment Processes

THE FALL AND RISE OF SEWAGE SALVAGE,
Wesley Marx.
Bulletin of the Atomic Scientists, Vol 27, No 5, p 10-15, May 1971. 4 fig.

Descriptors: *Waste water treatment, *Water reuse, *Water management (Applied), *Reclaimed water, *Sewage effluents, Semiarid climates, Water yield improvement, Land use, Economic feasibility, Irrigation practices, California.
Identifiers: *Land disposal.

Water reclamation is rooted in 2 traditionally fragmented operations, water supply and sewage treatment. The increasing importance of reclamation projects reflects changing attitudes in both fields. Tougher requirements in sewage discharges combined with increasing political and social problems related to vast water diversion projects have markedly increased the number and scope of reclamation projects, particularly in semiarid regions. Advanced water reclamation treatments need not be very advanced technically. Many types of irrigation (parks, crops, golf courses) require no more than secondary treatment and such effluents may therefore be economically competitive with domestic water supplies. A group of recreation lakes in semiarid Santee, California, have been developed with effluents subject only to secondary treatments because of the presence upstream of a natural creek and horizontal filtration beds. A number of other water reclamation projects are also discussed in detail. Land disposal of effluents, instead of water dispersion is also receiving increased attention. Increased public acceptability is leading to the impact of reclamation projects on increasingly larger areas of environmental management. While not always economically self-sustaining, this criterion is inadequate in the evaluation of such projects. (Casey-Arizona)
W71-10507

ENVIRONMENTAL ASSESSMENT REPORT.
Muskegon County Board, Mich.
For primary bibliographic entry see Field 06B.
W71-10518

WATER RESOURCES MANAGEMENT PLAN FOR MCHENRY COUNTY,
Bauer Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 06B.
W71-10538

MANAGEMENT OF EFFLUENTS FROM JAPC's NUCLEAR POWER STATIONS,
Japan Atomic Power CO., Tokyo.
T. Yoshioka, T. Itakura, and T. Hashimoto.
Availability: Unipub, Inc., P.O. Box 433, New York, N.Y. 10016. Proceedings IAEA-SM-146/27, New York, Aug. 10-14, 1970, p 439-451, 8 fig.

Descriptors: *Environment, *Effluent, *Nuclear power plants, *Nuclear wastes, *Waste treatment, Waste disposal, Monitoring, Liquid wastes, Gases, Water pollution, Air pollution, Pacific ocean, Thermal pollution.
Identifiers: Japan.

At the present in Japan, there are two commercial nuclear power stations in operation, both owned by the Japan Atomic Power Company. One is a magnox type 160 MW (e), in Tokai, and the other is a BWR type, 330 MW (e), in Tsuruga. The latter was completed in March 1970. There are also seven under construction, all of which are light-water type reactors. The presentation describes the effluent management conducted at Tsuruga Station (light-water reactor), which is based on: (1) gas effluent management; (2) liquid effluent management, and (3) environmental monitoring. (Houser-NSIC)
W71-10604

METROPOLITAN SITING OF NUCLEAR POWER PLANTS,
Consolidated Edison Co., New York.
For primary bibliographic entry see Field 05E.
W71-10605

THE UNITED KINGDOM APPROACH TO THE APPLICATION OF ICRP STANDARDS TO THE CONTROLLED DISPOSAL OF RADIOACTIVE WASTE RESULTING FROM NUCLEAR POWER PROGRAMS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England), Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05C.
W71-10607

TREATMENT OF RADIOACTIVE WASTE WATER AT THE KRB GUNDREMMINGEN NUCLEAR POWER PLANT,
Kernkraftwerk RWE-Bayernwerk G.m.b.H., Gundremmingen (West Germany).
H. J. Schroeder.
Availability: NTIS. NP-TR-1915, 19 pages, 1969; From Atomwirt., Atomtech., Vol 14, p 363-368, 1969.

Descriptors: *Waste treatment, *Water, *Nuclear reactors, *Effluents, Waste dilution, Waste water pollution, Water pollution, Water pollution sources, Rivers, Standards, Regulation, Water quality, Water quality control, Water reuse.
Identifiers: Danube River, Germany.

Radioactive waste water at the KRB Gundremmingen Nuclear Power Plant is treated in a special treatment plant and when satisfactory results are obtained after dilution it is discharged into the Danube. The principle of collecting waste water with different characteristics in separate systems and treating it by special processes has proved satisfactory. On an average 50 percent of the water treated in this way could be fed back to the power plant for re-use. Various laws and regulations introduced by the public authorities, however, resulted in restrictions being imposed on the utilization of the waste water treatment plant. (Houser-NSIC)
W71-10631

AN ELECTROMEMBRANE PROCESS FOR REGENERATING ACID FROM SPENT PICKLE LIQUOR,
Southern Research Inst., Birmingham, Ala.
Robert E. Lacey.
Copy available from GPO Sup Doc, EPA Project 12010 EOF 03/71, paper copy $1.00; microfiche from NTIS as PB-201 651. $0.95. Water Pollution Control Research Series, March 1971, 79 p, 11 fig, 11 tab, append.

Descriptors: *Industrial wastes, Treatment, *Membrane process, Waste water treatment, Steel, *Electrolysis, Iron, Ions, Ion exchange, Water reuse.
Identifiers: *Pickling (Steel), Waste recovery, *Sulfuric acid, *Steel wastes, Spent pickle liquor treatment, *Electromembrane process.

Studies of an electromembrane process for regenerating acid from spent sulfuric acid pickle liquor have indicated that the process is technically feasible. The studies have shown that the iron ions in spent pickle liquor can be removed and replaced by hydrogen ions to regenerate H_2SO_4 in electromembrane cells. A method of removing iron from spent liquor that involves the formation of insoluble iron hydroxides is preferrable to plating iron metal onto cathodes. Estimated treatment costs were $0.045 plus or minus 0.002 per gallon, whereas the combined costs of purchasing acid and disposing of spent liquor by existing methods were in the range of $0.015 to $0.06 per gallon of spent liquor. A determination of the long-term performance of the ion-exchange membranes when treating actual pickle liquors that contain organic pickling aids is needed.
W71-10640

FEASIBILITY OF JOINT TREATMENT IN A LAKE WATERSHED.
Weston (Roy F.), Inc., West Chester, Pa.

Available fron the National Technical Information Service as PB-201 698, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, November 1969. 113 p, 16 fig, 33 tab, 4 append. FWPCA Program 11060 FAE 11/69, Grant No. WPRD 66-01-68.

Descriptors: *Industrial wastes, *Municipal wastes, *Feasibility studies, Project planning, *Watersheds (Basins), *Lake basins, New York, Sampling, Laboratory tests, Organic loading, Toxicity, *Activated sludge, Cost analysis, *Waste water treatment, Sewage treatment, Sludge treatment.
Identifiers: *Joint treatment, Contact stabilization, Onondaga County (N.Y.).

A feasibility study to determine the practicality of joint treatment of municipal and industrial wastewater was initiated in Onondaga County, New York. The 24 industries include in both the Ley Creek and the Metropolitan Sanitary districts were contacted as to their production of wastewaters and their effluents samples as needed. Bench scale studies were then used to determine the feasibility of the various activated sludge system. A sampling and analysis program was conducted to determine the characteristics of the wastewater influents to both plants, with the results indicating that although toxicity was a potential problem it was

causing no problems at present. Therefore, the primary pollutant to be removed was organic material. Total organic loads at both the Ley Creek and the Municipal Plant were equal, but flow to the Municipal Sewage Treatment Plant was nearly three times as great as the flow to Ley Creek. The Municipal Sewage Treatment Plant was chosen as the outfall because of greater dilution capacity of Onondaga Lake. Activated sludge treatment of the primary effluent of both plants was shown to be feasible, with the Ley Creek Sewage treatment plant destined for eventual phasing-out. Cost estimates for different system configurations (conventional activated sludge, contact stabilization, etc.) ranged from $23,000-$30,000 for capital cost and $3,700-$4,400/year for operation and maintenance. The full-scale joint treatment operation was forecast to be able to obtain in excess of 85% BOD removal during winter operation. (Lowry-Texas)
W71-10650

POLYMERIC MATERIALS FOR TREATMENT AND RECOVERY OF PETROCHEMICAL WASTES,
Gulf South Research Inst., New Orleans, La.
Elias Klein, Shyamkant V. Desai, James K. Smith, and Robert E. C. Weaver.
Copy available from GPO Sup Doc, $0.70 in paper copy; microfiche from NTIS as PB-201 699, $0.95. Water Pollution Control Research Series, March 1971, 68 p, 12 fig, 29 tab, 12 ref. EPA Program 12020 DOC 03/71.

Descriptors: *Reverse osmosis, *Chemical wastes, Industrial wastes, Separation techniques, *Membranes, Cellulose, Permeability, Viscosity, Pressure, Neutralization, Cost analysis, Evaluation, Amortization, Hydrogen ion concentration, Color, *Waste water treatment, Osmosis, *Oil wastes, Membrane processes.
Identifiers: *Glycerin, Flux, Multi-stage operation, Rejection, Polymeric materials.

Three operational modes for removing glycerin from waste streams by reverse osmosis were examined. The three modes were: (1) a single-stage reverse osmosis unit which was demonstrated to be capable of removing 27% of the available glycerin, 92% of the inorganics, and 94% of the polyglycerines available in the feed; (2) a three-battery multi-stage unit with forward feed of the raffinate to subsequent reverse osmosis recovery batteries which provided a product stream containing 31% of the available glycerin, no inorganics, and 3.9% of the available polyglycerines; and (3) an alternate two battery multi-stage counter-current recovery unit which provided a waste stream containing 31% of the available glycerin, no inorganics, and 5.2% of the available polyglycerines. Membranes used were asymmetric cellulose acetate butyrate and cellulose acetate. Experimental pilot scale studies performed with tubular membrane models readily accomodated the sample plant stream being used. Optimum selectivity and good separation was achieved under operating pressures ranging from 600 to 800 psig. Product throughput rate appeared to be the limiting factor, being highly sensitive to both increased turbulence and reduced feed viscosities. Analysis of a typical multi-stage forward feed operation operated at 600 psig revealed an estimated capital cost of $133,600, annual operating expenses of $20,700, and a total yearly credit from a 10 year base depreciation and sale or re-use of the glycerin recovered of $75,610. Payout for the operation was 3.8 years at a 26% rate of return, making it an extremely favorable investment. (Lowry-Texas)
W71-10651

VORTEX SEPARATION FOR OIL SPILL RECOVERY SYSTEMS.
American Process Equipment Corporation, Panama City, Florida.
For primary bibliographic entry see Field 05G.
W71-10653

DEMONSTRATE FEASIBILITY OF THE USE OF ULTRASONIC FILTRATION IN TREATING THE OVERFLOWS FROM COMBINED AND/OR STORM SEWERS.
Acoustica Associates, Inc., Los Angeles, Calif.

Available from the National Technical Information Service as PB-201 745, $3.00 in paper copy, $0.95 in microfiche. Final Report September 22, 1969, 86 p, 10 fig, 1 tab, 3 append. FWPCA Program 11020--09/67, Contract No. 14-12-23.

Descriptors: *Ultrasonics, *Suspended load, *Filtration, Algae, Colloids, Flocculation, Mixing, Economic feasibility, Technical feasibility, Cost analysis, Sludge, Incineration, Storm run-off, Sedimentation, Biochemical oxygen demand, Waste water treatment, Overflow, Sewers, Storm drains, Sewage effluents, *Sewage treatment, Storm runoff.
Identifiers: Backwashing, *Suspended solids, *Combined sewers, Stormwater overflows.

The feasibility, both economic and technical, of using ultrasonic filtration as an aid to removing suspended impurities was investigated. Inputs to the test apparatus included drinking water, simulated sewage, primary and secondary sewage effluents, algae pond effluent, coarsely screened, raw sewage diluted 2:1, 5:1, and 10:1 with simulated storm drainage, and deliberately concentrated raw sewage. Dirt, sand, and leaves were added in some test runs with no apparent effect on performance. 20 and 50 micron filter elements, operated at approximately 10 gpm/ft2 with head losses from 1 to 4 psi, reduced the BOD and suspended solids of raw sewage diluted in varying degrees with water by an average of 40 and 70% respectively. System performance was intermediate between that of primary and secondary treatment. Other benefits included: (1) application of ultrasonic energy increased the total quantity of effluent filtered between backwash cycles from 4 to 18 times that treated with similar equipment without ultrasonics applied; and (2) application of ultrasonic energy restored the filter elements to 'like-new' condition without necessitating frequent filter replacement. Cost figures for an ultrasonic filtration system capable of handling 1.4 mgd, exhibiting performance midway between primary and secondary treatment, and occupying only several hundred square feet, ranged between 2.8 and 3.5 cents/1000 gallons. By comparison, combined primary-secondary treatment cost figures were reported as 10 cents/1000 gallons excluding the cost of the considerable amount of land involved. (Lowry-Texas)
W71-10654

MUNICIPAL SEWAGE TREATMENT WITH A ROTATING BIOLOGICAL CONTACTOR.
Allis Chalmers, Milwaukee, Wis. Research Div.

Available from the National Technical Information Service as PB-201 701, $3.00 in paper copy, $0.95 in microfiche. Final Report, May 1969, 57 p, 15 fig, 10 tab. FWPCA Program 17050 DAM 05/69.

Descriptors: *Slime, *Microorganisms, *Waste water treatment, *Municipal wastes, Organic loading, Chemical oxygen demand, *Biochemical oxygen demand, Nitrogen, Phosphorus, Hydrogen ion concentration, Temperature, Turbidity, Instrumentation, Sludge, Wisconsin, *Sewage treatment, Biological treatment.
Identifiers: *Rotating biological contactor, Hydraulic loading, Milwaukee.

The Milwaukee Metropolitan Sewerage Commission, in conjunction with the Allis Chalmers Research Division, installed a rotating biological contactor (RBC) to treat municipal sewage. The RBC obtained in excess of 90% BOD removal at loading rates of 350 to 400 lbs COD per day per 1000 ft3 of disc volume. Nitrogen was shown to be removed in a ratio of 1:25, nitrogen to COD. Percent BOD removal was consistently 5% greater than percent COD removal. Treatment efficiency was increased with increased detention time, and decreased by: (1) lower disc speed; (2) lower strength wastes; and (3) high hydraulic loading. Recovery from periods of high hydraulic loading was extremely quick. Further planned investigations included isolation and identification of individual species of microorganisms and comparison with the microorganisms of activated sludge and trickling filters. (Lowry-Texas)
W71-10655

ECONOMIC ANALYSIS OF THE MEMBRANE WATER DESALTING PROCESSES,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 03A.
W71-10657

DEVELOPMENT OF A THIN-LIQUID-FILM MEMBRANE DEVICE FOR REVERSE OSMOSIS,
Dorr-Oliver Inc., Stamford, Conn.
For primary bibliographic entry see Field 03A.
W71-10661

A REVIEW OF THE 1970 LITERATURE ON WASTE WATER AND WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 05G.
W71-10691

BENEFICIAL USES OF WASTE HEAT--AN EVALUATION,
Environmental Protection Agency, Corvallis, Oregon. Pacific Northwest Water Lab.
Ronald R. Garton, and Alden G. Christianson.
Available from the National Technical Information Service as PB-201 724, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, N.D. 7 p, 7 ref. EPA Program 16130 FHJ 09/70.

Descriptors: *Thermal pollution, *Beneficial use, Thermal powerplants, Pollution abatement, *Cooling water, Heated water, Evaluation, Environmental effects, Consumptive use, *Feasibility studies, *Technical feasibility, *Economic feasibility.
Identifiers: Waste heat.

There are a number of proposed beneficial uses of waste heat contained in power plant cooling water. Included are those for which the technical feasibility has been demonstrated in pilot programs and those which are, at best, imaginative ideas. Primary concern is with solving the environmental pollution problem. Seen from this standpoint, a beneficial use must help reduce the thermal pollution problem directly or must provide a profit to help offset the cost of cooling devices. The use must not result in additional pollution such as that resulting from untreated organic wastes. Some uses, such as the culture of certain fishes, are now at the pilot program, or even commercial, stage. Other uses, such as for industrial processes, require additional research. Integrated systems planned to produce steam as well as electrical power have been successful in special situations. In nearly all cases additional information is not on the overall economics of proposed methods. This is especially true where high quality heat is taken directly from the power plant steam cycle for another use. Only with a complete economic analysis, including cost of distribution and waste treatment, can the final decision be made to whether a 'beneficial use' is truly beneficial in the long run.
W71-10748

STORM AND COMBINED SEWER POLLUTION SOURCES AND ABATEMENT--ATLANTA, GEORGIA.
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 05B.
W71-10749

EVALUATION OF CURRENT TECHNIQUE FOR NUTRIENTS REMOVAL FROM WASTE WATERS,
Mississippi State Univ., State College. Dept. of Civil Engineering.
Adnan Shindala.
Available from the National Technical Information Service as PB-201 751, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Mississippi Water Resources Research Institute, State College, June, 1971, 78 p, 6 fig, 8 tab, 200 ref. OWRR Project A-043-MISS (1).

Descriptors: Eutrophication, Tertiary treatment, *Waste water treatment, Bibliographies, *Reviews, *Nitrogen, *Phosphorous, Nutrients.
Identifiers: *Nutrient removal.

Treated wastewaters both industrial and municipal may be considered as one of the principal contributors of nutrients. Until recently, removal of nutrients has not been considered as an objective of waste water treatment nor has it been the goal of water quality regulations. The increasing fertilization of natural waters coupled with the increasing demand for surface waters has focused attention on nitrogen and phosphorus as major water pollutants. Since conventional wastewater treatment processes have proven inefficient in removing nutrients, new techniques have to be investigated. The extensive research conducted within the last several years has led to the development of new methods capable of removing a high fraction of nitrogen and phosphorus from wastewaters. Available techniques for nutrients removal were evaluated with regard to classification, cost, ease of operation, and efficiencies. Evaluation was based on an extensive search of the literature.
W71-10761

RECOVERY OF MICA FROM SILT DEPOSITS IN THE NOLICHUCKY RESERVOIR, TENNESSEE,
Bureau of Mines, Washington, D.C.
Ralph B. Adair, and Jerome O. Crabtree.
Available from the National Technical Information Service as PB-198 289, $3.00 in paper copy, $0.95 in microfiche. Rept. of Investigations. BM-RI-7488, Mar. 1971, 13 p.

Descriptors: *Silts, *Reservoirs, Tennessee.
Identifiers: *Mica, Recovery, Deposits, Sampling, Muscovite, Flotation, Quality, Production, Nolichucky Reservoir, Greeneville (Tenn).

The Bureau of Mines conducted laboratory batch and small-scale continuous tests on samples of filt from the Nolichucky Reservoir near Greeneville, Tenn., to develop a process for the recovery of commercial-grade muscovite concentrates. Using a combination of Humphreys spirals for preconcentration followed by cationic flotation, 94.5 percent of the muscovite was recovered in a product containing 96.5 percent muscovite.
W71-10767

EXTRACTION METHOD OF REGENERATING WATER IN CLOSED ECOLOGICAL SYSTEMS,
G. P. Khomchenko, S. V. Chizhov, Yu E. Sinyak, V. V. Sergievskii, and L. A. Kuznetsova.
Available from the National Technical Information Service as JPRS-52696, $3.00 in paper copy, $0.95 in microfiche. JPRS translation from Izvestiya Timiryazevskoy Sel'sko-Khozyaystvennoy Akademii, No 1, p 183-188, 1971.

Descriptors: *Water treatment, *Water reuse, *Water purification, Desalination, Urine, Domestic wastes.
Identifiers: *Closed ecological systems, *Life support systems, USSR.

The problem of closed ecological systems has begun to attract attention because of space exploration. Those systems are usually called closed in which the physical factors of the ecological environment are maintained at the desired level by the cycle of matter and constant reuse of the main chemical substances required by man. The reserves of consumable materials on board a spacecraft increase with the duration of the flight, resulting in a highly undesirable starting weight of the craft. Regenerative systems are desirable for 15- to 20-day flights (1, 4, 6, 7). And for longer flights, the regeneration of consumable materials will be absolutely essential. Water is only one type of consumable item, but it weighs twice as much as the oxygen and food. Therefore, the greatest saving in weight will come from regenerating water from moisture-containing things. The selection of a water regeneration method is determined by a number of factors, mainly by the qualitative and quantitative composition of the moisture-containing things (condensates of atmospheric moisture and fuel elements, urine). Several techniques have been devised for regenerating water: sorption, oxidative-catalytic, vacuum distillation and lyophilization. Extraction methods began to be used comparatively recently. Two approaches are theoretically possible: extraction of impurities from water and extraction of water from solutions. This article examines the problems connected with the extraction method of regenerating water and an evaluation of it from the biomedical point of view.
W71-10781

APPLICATION OF RADIOISOTOPES TO WATER RECOVERY SYSTEM FOR EXTENDED MANNED AEROSPACE MISSIONS,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
Courtney A. Metzger.
Available from the National Technical Information Service as AD-718 965, $3.00 in paper copy, $0.95 in microfiche. Aerospace Medical Research Lab Report TR 70-31, Aug 1970. 23 p.

Descriptors: *Urine, *Domestic wastes, Water treatment, *Water reuse, Radio isotopes, Nitrites, *Potable water, Distillation, Catalysts, Membranes, Bacteria, Waste water treatment.
Identifiers: *Life support, *Water treatment devices, *Radioisotope heat sources.

Research conducted to obtain a process and system design for the recovery of potable drinking water from human waste during extensive space flights revealed that the most promising process required considerable thermal energy for satisfactory operation. The large consumption of electrical energy prohibits system acceptability when the energy drain is on the vehicle electrical supply system. To meet the need for thermal energy, radioisotopes were investigated and found to conform with the known requirements. The Air Force designed laboratory Vacuum Distillation-Vapor Filtered Catalytic Oxidation Water Recovery System, which uses electric energy, was redesigned to accept radioisotopes. Specific isotopes were designed for integration with the Air Force modified system. The review of previous research on water recovery systems, the design and development of the Air Force modified system, and detailed data on two (36 and 39 day) tests with the isotopes in place supplying the total thermal energy is presented in the report. The complex system is considered a technological breakthrough and for the first time, a radioisotope fueled system is programmed for a 90-day manned chamber test, recovering drinking water from human waste for consumption by four crewmen during the experiment.
W71-10797

DETECTION OF HIGHLY DILUTED VIRUSES IN WATER BY FLOCCULATION,
Michigan State Univ., East Lansing.
Walter N. Mack.
Available from the National Technical Information Service as PB-201 732, $3.00 in paper copy, $0.95 in microfiche. Completion Report, November 1969, 5 tab, 6 ref. OWRR A-026 Mich (2).

Descriptors: *Flocculation, *Bacteriophage, *Sewage effluents, Centrifugation, Treatment facilities, Bottom sediments, *Waste water treatment, *Viruses, Public health.
Identifiers: *Poliovirus, T-3, *Polymers, Cationic polymers.

Cationic polymers known as flocculants were tested for effectiveness in concentrating virus particles present in large bodies of water. Preliminary studies were done using the bacteriophage T-3 and concentrations of 50, 75, and 100 ppm of flocculant. The virus was suspended in polluted river water and at each level of concentration, there was more virus recovered in the sediment compared to the supernatant liquid. Additional experiment with T-3 measured virus recovery from water after treatment with 100 ppm flocculant at pH 5 and 9 and treated with detergents. Similar results were found. A second series of experiments centered on polio virus suspended in Hanks' balanced salt solution. The flocculation did not inactivate the virus and resulted in the virus concentration. Pad and dip samples were collected from a final settling tank of a waste water plant and then tested for virus after concentrating the samples by (1) flocculation, and (2) ultracentrifugation. One pad sample was shown to contain virus when treated with a flocculant while five samples were found to contain virus when ultracentrifuge concentration was used. (Burdette-Texas)
W71-10838

CITY AND INDUSTRY COOPERATE TO SOLVE BRINE WASTE PROBLEM,
Boyle Engineering, Bakersfield, Calif.
Don Burr, and Peter J. Byrne.
Public Works, Vol 102, No 1, January 1971, p 46-48, 1 fig.

Descriptors: *Sewage treatment, Municipal wastes, *Industrial wastes, *Waste water treatment, *Water quality, Settling basins, Pipelines, Biochemical oxygen demand, *Chlorides, California, Dissolved solids.
Identifiers: Lindsay (Calif), Consolidated Olive Growers, Combined treatment, Brine wastes, Evaporation ponds, Olive wastes.

Treatment of industrial wastes with domestic sewage in municipal plants is a meritous concept, but may become less attractive when the volume of the former constitutes a larger percentage of the combined load. This was the case with the city of Lindsay, located in the central San Joaquin Valley in California. Large quantities of waste generated by Consolidated Olive Growers (COG), a cooperative with close economic ties with the community, proved to tax local facilities beyond acceptable bounds. The waste water had total dissolved solids concentrations of 10,000 to 15,000 mg/l, the major constituent being chlorides (3,500 to 6,000 mg/l). Limited tests indicated BOD ranged between 1,500 and 2,500 mg/l. In 1964 the Regional Water Quality Control Board imposed chloride and total dissolved solids limits, which threatened to force the city to limit industrial discharges and eventually cause various industries to cease operation. Several alternatives were reviewed by a joint committee of city and COG leaders. Finally a separate facility for industrial waste was approved: a 16 inch pipeline was installed to transport waste to brine evaporation ponds. Participating industries paid for all direct costs for maintenance, operation, repair and replacement of the new industrial line and evaporation basins. This combined community effort in solving the waste problem was commended by the Water Quality Control Board. (Burdette-Texas)
W71-10839

PHOSPHATE RECOVERY FROM SECONDARY SEWAGE WASTE: THE ECONOMICS OF THE PROCESS,
Toronto Univ. (Ontario).
R. L. Hummel, and J. W. Smith.

Water and Pollution Control, Vol 108, No 2, December 1970, p 28-31, 4 tab, 5 ref.

Descriptors: *Sewage treatment, *Cost analysis, *Phosphates, Operating costs, Labor, Steam, Capital costs, Cost-benefit ratio, Waste water treatment, Industrial wastes, Costs.
Identifiers: *Waste recovery, Phosphate recovery.

A potential industrial process-phosphate recovery from secondary sewage waste-is considered only for its direct economic return. Costs for such a venture are comprised primarily of operating costs and capital costs. Operating costs are subdivided into chemicals (which also provide the sole source of revenue in the marketability of extracted NH3 and P2O5 in the final product), steam costs, and labor costs. Estimated dollar expenditures are assigned to the operating costs and the capital costs, which include the relatively uncertain cost of the reciprocating flow ion exchange system and the remaining conventional equipment which can be costed quite accurately. The economics of the process are expressed in terms of the net return on investment-or the ratio of revenue to capital costs. A table of the % return for various combinations of cases for labor and steam are listed which yield returns that range between 12% and 30%. Thus, the attractiveness of the proposal depends upon the combination employed and any government assistance in financing and/or subsidy in operation. This process would undoubtedly aid in the solution of one or more pollution problems, and although no value was assigned to this factor, it would certainly be of primary importance. (Burdette-Texas)
W71-10840

A GENERALIZED THEORY OF SORPTION PHENOMENA IN BIOLOGICAL MATERIALS (PART I: THE ISOTHERM THEORY),
Michigan State Univ., East Lansing.
P. O. Ngoddy, and F. W. Bakker-Arkema.
Transactions of the ASAE, September-October 1970, Vol 13, No 5, p 612-617, 7 fig, 2 tab, 34 ref.

Descriptors: *Sorption, *Mathematical models, *Isotherms, Vapor pressure, Pores, Capillary action, *Adsorption, Absorption, Hydroscopic water, Foods, Surfaces, Surface tension.
Identifiers: Polanyi's potential theory, B-E-T theory, Zsigmondy's capillary condensation theory.

A basic characteristic of biological materials is that when exposed to water vapor of a definite pressure, sorption will occur. The relationship between the amount of water absorbed and the vapor pressure is represented by the moisture equilibrium isotherm. Combining valid points of unsatisfactory models, an isotherm equation was constructed for biological materials based primarily on the B-E-T and capillary condensation theories and somewhat indirectly on the potential theory. A physical model of an organic tissue assumed intercellular passageways (formed by a random network of small irregular pores) could be treated as cylinders which are isothermally filled or emptied of water vapor as a function of surface forces active on the pore walls. The model was used to characterize the pores in terms of size and size distribution which enabled computation of the utilizable volume. Calculation of theoretical isotherm was empirically done for raw freeze-dried beef slices (at 10 C and 40 C) and for whole corn kernels (at 22 C and 50 C). Parameters of pore structure were discussed. Isotherm equations make possible the prediction of the effect of changes in temperature and pressure on sorption of a given product, and also provide information directly useful in the accurate and optimum design of drying equipment. (Burdette-Texas)
W71-10841

FURTHER THOUGHTS ON TRADE EFFLUENT CHARGES,
Nottingham Sewage Disposal Dept. (England).
H. McD. Lawson, and R. J. Fearn.
Water Pollution Control, Vol 69, No 4, 1970, p 436-444, 23 tab, 2 ref.

Descriptors: *Cost analysis, *Industrial wastes, *Municipal wastes, Flow, Biochemical oxygen demand, Chemical oxygen demand, Toxicity, Sewers, Sludge, Analytical techniques, Activated sludge, Waste water treatment, Treatment facilities.
Identifiers: *Nottingham, *England, Suspended solids, Plating wastes, *Effluent charges.

Many cities have been attempting to determine a fair trade effluent charge with which to finance additional treatment facilities which must be constructed to handle industrial wastes. The city of Nottingham has developed a schedule whereby costs for each industry are based on: (1) additional sewerage capacity needed for industrial flows; (2) additional treatment plant capacity based on both on flow and on oxygen demand; and (3) additional sludge handling and disposal based primarily on suspended solids tests. Charges were not levied for toxic constituents as long as they neither upset the biological portion of the system nor caused the treated effluent to exceed standards set by the Trent River Authority. Problems developed in the standardization of both the suspended solids tests and the oxygen demand tests. In the latter case, industries wanted to have a test which did not involve a lot of laboratory time and would yield quick results. The Dichromate Value test was selected as the most optimal assay technique for this case after being compared with the 5 day BOD test and the permanganate value test. In the case of suspended solids tests, a need still exists for a sampling machine which will standardize results. (Lowry-Texas)
W71-10842

'CLEAN WATER DAY' PROMISES IMPROVED WASTEWATER TREATMENT,
Paso Robles, Calif.
Alex Stenman.
Public Works, Vol 101, No 9, September 1970, p 84-85, 2 fig.

Descriptors: *Cost analysis, *Sewage treatment, *Design criteria, Treatment facilities, Evaluation, Waste water treatment, Design flow, Biochemical oxygen demand, Aeration, Scum, Trickling filter, Recirculated water, Sedimentation, Chlorination, Oxidation lagoons, Percolation, Digestion, Dewatering, California.
Identifiers: Paso Robles (Calif).

Paso Robles, California started working toward increasing the capacity of their sewage treatment facility in 1965. Although the plant was capable of discharging a high quality effluent with better than 90% reduction of BOD and suspended solids, the capacity was often exceeded at peak flows, bringing about a danger of deterioration of the Salinas River. With the aid of a $357,000 grant from the Federal Water Quality Administration for waste water systems improvements and a bond issue voted by the city, money was appropriated for the needed work. The new design specifications were approved and bids were taken in 1970. The new design calls for retaining some of the old treatment structures, modernizing the whole treatment plant, and additions of new equipment to enlarge the average flow capacity of the plant from 1.1 mgd to 2.2 mgd. Provisions are to be made for expansion of the facilities to handle an average flow of 4.4 mgd some time in the future. The design basis considered 130 gal. per capita per day from a population of 17,000 in comparison to Paso Robles's present population of 8,100. The system consists of a bar screen chamber, preaerator, primary sedimentation basin with provision to be made for mechanical sludge and scum removal, trickling filter, chlorinator, oxidation ponds, percolation ponds, and sludge drying beds. The low bid of $765,000 was well within the engineers estimate of $875,000. The success of the project was a result of the community's thorough preparation and pains-taking effort. (Adkins-Texas)
W71-10843

ISOLATION AND DESCRIPTION OF A NON-MOTILE FUSIFORM, STALKED BACTERIUM, A REPRESENTATIVE OF A NEW GENUS,
Michigan State Univ., East Lansing. Dept. of Microbiology and Public Health.
J. A. M. De Bont, J. T. Staley, and H. S. Pankratz.
Antonie van Leeuwenhoek, Vol 36, 1970, p 397-407, 5 fig, 10 ref. OWRR Project A-027-Mich (1).

Descriptors: *Cytological studies, *Isolation, *Separation techniques, Analytical techniques, Bacteria, Microorganisms, Laboratory tests, Electron microscopy, Metabolism Protein, Vitamins, Hydrogen ion concentration, Temperature, Waste water treatment.
Identifiers: *Fusiforms, *Caulobacters, Culturing, Dimorphic, Flagellum, Stalk.

The family Caulobacteraceae originally contained only Caulobacter and Asticcacaulis, both of which produced non-stalked polarly flaggelated swarmer cells at the pole opposite the stalk of the original cell. The family was so described originally to include a genus containing non-motile stalked bacteria which produce two stalked daughter cells upon division. Henrici and Johnson (1935), Zavarzin (1961), and Poindexter (1964), have all reported finding such a bacterium, however, this publication reports the first successful attempt at isolation along with a description of the isolate. A single strain of the fusiform group of the caulobacters was isolated from a freshwater pond using the peptone enrichment method. This single strain resembled the genus Caulobacter in that it was a chemo-organo-trophic bacterium with on polar prostheca containing an apical holdfast that allows it to attach to solid substrates. Unlike the prostheca of Caulobacter and Asticcacaulic, both of whose stalks are made of membranous material, the isolate's stalks contained typical cellular constituents. The new organism also differed from the other Caulobacters by having no motile stage and no dimorphic life cycle. The evidence obtained from this study gave indications that the new strain may possibly be a representative of a new genus of the Schizomycetes. (Lowry-Texas)
W71-10844

TECHNIQUES AND RECENT DEVELOPMENTS IN SEWAGE WORKS DESIGN,
James R. P. Boyd.
Water Pollution Control, Vol 69, 1970, p 62-66, 3 fig.

Descriptors: *Waste water treatment, *Sludge disposal, Sludge, Tertiary treatment, Activated sludge, Storm run-off, Dewatering, Odors, Efficiencies, Maintenance, Labor, Evaluation, Biological treatment.
Identifiers: *Great Britain, *Biological filtration, Ozonation.

Extension of the piped water supplies in Great Britain at the end of World War II led also to the provision of sanitary facilities. In constructing these facilities, little attention was directed towards innovations and improvements since prior designs had been functioning quite well. In the case of sludge disposal, the drying beds installed at the close of the war have been gradually giving way to other sludge handling and disposal methods. Mechanical methods, such as sludge pressing, the Komline-Sanderson Coil Filter, and others, have been developed concurrently along with heat treatment and heated digestion studies have been continuing in the development of more effective or efficient processes also, in an attempt to make the sewage treatment processes more attractive both with respect to the attitude of potential operators and other individuals. Storm tanks or irrigation areas are also presented as viable alternatives to direct discharge of storm sewage. Finally, efficiency of crews and the state of construction in the industry are discussed, all with reference to current British practice. (Lowry-Texas)
W71-10845

ALTERNATIVES FOR PHOSPHATE REMOVAL,
Neptune Micro FLOC, Inc., Corvallis, Oreg.
Stewart Davis.
Water and Sewage Works, October 1970, Vol 117, No 10, p 336-338, 3 fig, 1 tab, 2 ref.

Descriptors: *Waste water treatment, *Filtration, *Flocculation, *Settling basins, *Phosphates, Storage time, Tertiary treatment, Treatment facilities.
Identifiers. Micro FLOC, Tube settlers, Mixed-media filter, Phosphate removal.

A new waste treatment unit designed and constructed by Neptune Micro FLOC, Inc., has been tested for removal abilities at several installations throughout the county. Much of the testing focused on phosphate removal; one report showed the secondary effluent phosphorous concentration was reduced from 5.6 mg/l (PO4 as P) to 0.05 mg/l when the secondary effluent was subjected to alum coagulation and passed through the treatment unit. The units feature (1) tube settlers which permit the design of clarification systems at detention time significantly less than is possible with traditional clarifiers, and (2) mixed-media filtration that has a coarse to fine gradation normally composed of coal, sand and garnet. There are five units in operation ranging in capacity from 20 gpm to 75 gpm with units up to 200 gpm ready for installation. The flocculation-settling-filtration steps can be incorporated into a single, steel module that, for a 20 gpm unit, measures 5 ft long by 5 ft wide and 6 ft high. (Burdette-Texas)
W71-10846

MECHANISM OF STARCH REMOVAL IN ACTIVATED SLUDGE PROCESS,
Illinois Univ., Urbana.
Shankha K. Banerji, Benjamin B. Ewing, R. S. Engelbrecht, and Richard E. Speece.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, 1965. p 84-102, 11 fig, 3 tab, 19 ref.

Descriptors: *Colloids, *Activated sludge, Adsorption, Suspension, Biochemical oxygen demand, Temperature, Acclimatization, Enzyme, Assimilation, Molecules, Industrial wastes, Pulp and paper industry, Textiles, Sludge, Waste water treatment.
Identifiers: *Potato starch, Extracellular enzymes, Dairy plants, Food processing industries.

Information on the removal behavior of collodial and particulate organic matter in biological waste treatment is very limited. The lack of information is becoming more noticable due to speculation that colloids comprise up to 52% of the biochemical oxygen demand and 54 percent by weight of suspended solids. Wastes from industries such as textile desizing, paper and pulp mills, dairy product processing, and food processing are likely to have high percentages of colloids. A colloid was chosen to be studied as to the process by which it was removed from sludge. The colloid chosen was potato starch, due to its wide use in industry. Using the results of the investigation as a basis, the mechanism of removal of starch by activated sludge has been postulated as follows: (1) a portion of starch was adsorbed on the sludge, depending on the existing conditions (temperature, acclimation, amount of sludge and physiological condition of the sludge); (2) the adsorbed starch was degraded by the cell-wall associated enzyme systems into smaller degradation products; (3) the starch degradation products were utilized by the cells for assimilation; (4) the starch in the medium was either adsorbed on the cell sites vacated by the degraded starch molecules, or was degraded by small amounts of extracellular enzymes in the medium. (Adkins-Texas)
W71-10847

PURIFICATION OF INDUSTRIAL WASTE WATERS WITH HIGH ENERGY RADIATION,
Oak Ridge National Lab., Tenn. Isotopes Information Center.
L. M. Makarochkina, A. K. Mikhailova, A. I. Gershenovich, D. I. Danilin, and P. V. Dzhagatspanyan.
Available from the National Technical Information Service as ORNL tr-2389, $3.00 in paper copy, $0.95 in microfiche. AEC Report ORNL tr-2389, 13 p, 7 fig, 3 tab, 13 ref.

Descriptors: *Surfactants, *Irradiation, *Foaming, Sulfonates, Soaps, Detergents, Gamma rays, Analytical techniques, Sectroscopy, Colorimetry, Laboratory tests, Temperature, Hydrogen ion concentration, Nitrogen, Oxygen, Air, Biodegradation, Industrial wastes, Water purification, Waste water treatment.
Identifiers: *Radiolysis.

Surface active substances (SAS) have become a matter of considerable concern owing to their tendencies to form foams which upset treatment processes. Many of these compounds are resistant to biochemical degradation, so experiments were conducted to determine the feasibility of using gamma irradiation to decompose them. Both the methyl blue photocolorimetry test and ultraviolet spectroscopy were employed to determine the degree of decomposition of the compounds. Substances used included the ionogenic compounds Nekal, sulfonal, and STEK, and the nonionogenic OP-7 and OP-10. The solutions of these compounds were irradiated in the presence of pure oxygen, pure nitrogen, or air. At radiation doses varying from .2 to 30 rads/sec, all of the studied compounds were converted to substances not having surface active properties. Foam formation was not observed in irradiated solutions, the surface tension increased to values for pure water, and the SAS concentration in solution decreased to values not determinable with MB, or at the limit of resolution of this method, showing 90 to 100% decomposition. Decomposition was found to be independent of pH, temperature, and mineral impurities. However, use of oxygen or air caused greater decomposition yields than use of nitrogen. Within the limits of the compounds studied and the precision of the analytical techniques used, radiolysis of the differing compounds appeared to be independent of structure. Further work, to establish both the exact decomposition mechanism and the cost is necessary. (Lowry-Texas)
W71-10848

TREATMENT AND DISPOSAL OF SOLID WASTES WITH SPECIAL REFERENCE TO BRITISH PRACTICE,
North Survey Joint Sewage Board (England).
H. H. Stanbridge.
Conference Paper W2, Institute of Water Pollution Control, March 16-20, 1970, Capetown, South Africa, 22 p, 16 ref.

Descriptors: *Sludge, *Sludge disposal, Anaerobic digestion, Dewatering, Drying, Incineration, Flotation, Centrifugation, Vacuum drying, Neutralization, Filtration, Lagoons, Odors, Mixing, Shear, Fertilization, Climatic zones, Waste water treatment.
Identifiers: *United Kingdom, *Compositing, Wet-air oxidation.

The quantity of solid matter being handled at sewage works rose from 0.15 lb/hd/d in 1954 to 0.18 lb/hd/d in 1967 and is still increasing. There are several treatments which can be used to reduce the handling and disposal problems associated with these sludges, such as: (1) concentration (gravity); (2) conditioning; (3) dewatering; (4) drying, (5) drying-incineration; and (6) wet-air oxidation. The following factors usually determine the choice of a particular treatment scheme: (1) cost per unit weight of dry solids; (2) land area required; (3) operational manpower requirements; (4) process reliability; (5) process flexibility; (6) mechanical maintenance requirements; (7) character of the produce and the disposal method; (8) character of the liquor; and (9) aesthetic considerations. A review of the equipment presently operating in each of the major categories is presented along with the current state of development of a particular process or mechanism in the United Kingdom. Cold wet winters and diminishing land area practically precludes open-air drying beds in the present day United Kingdom, and much research on mechanical treatment methods is being conducted. Final disposal may be accomplished by tipping, sea disposal, land irrigation, and sacrificial land usage. Composting has been practiced in the past, but has not proved to be more than marginally practical at best. (Lowry-Texas)
W71-10849

OPTIMAL PLANS FOR THE CAPACITY EXPANSION OF A MUNICIPAL WATER-TREATMENT-DISTRIBUTION SYSTEM,
Illinois Univ., Urbana. Dept. of Business Administration.
For primary bibliographic entry see Field 05F.
W71-10866

REQUIREMENT FOR SUBMISSION OF MONTHLY OPERATION REPORTS BY INDUSTRIAL, COMMERCIAL, OR AGRICULTURAL TREATMENT FACILITIES.
Indiana Stream Pollution Control Board, Indianapolis.
For primary bibliographic entry see Field 05G.
W71-10942

AMORTIZATION OF CERTIFIED POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 06E.
W71-10943

5E. Ultimate Disposal of Wastes

METROPOLITAN SITING OF NUCLEAR POWER PLANTS,
Consolidated Edison Co., New York.
L. H. Roddis, Jr.
Availability: Unipub, Inc., P.O. Box 433, New York, N.Y. 10016. Proceedings IAEA-SM-146/43, p 723-29.

Descriptors: *Environment, *Nuclear power plants, *Thermal pollution, *Thermal power plants, *Temperature, Ecology, Balance of nature, Economics, Sites, Evaluation, Water pollution, Water pollution sources, Hydrology, Geology, Meteorology, Pollution abatement, Population.
Identifiers: Siting.

The case is analyzed for and against metropolitan siting of nuclear plants, using as a model the New York City area. The economic benefits of proximity to load centre are explored with respect to transmission costs and to opportunities for waste-heat utilization in urban areas. The relative environmental impact of nuclear and fossil-fuel plants are evaluated. The benefits are discounted by residents of a metropolitan area because the obvious per capita benefits are small. By contrast, residents of smaller out-of-city locations perceive construction and operation of a plant as yielding large, and tangible economic gains (through utility tax payments or jobs). This has obvious ramifications for relative public acceptance. How a metropolitan site presents unique advantages and disadvantages with respect to geological, meteorological and hydrological criteria for siting nuclear plants is explored. For example, large cities throughout history have tended to be located on navigable waters. This has ramifications for cooling water availability and for disposal of radioactive waste. On the other hand, heavy traffic on waterways means higher risk of accident or collision, with release of radioactivity. Similarly, the meteorology of city areas carries special risks of temperature inversions, which pose special ramifications on the environmental problems of both nuclear and fossil-fuel plants. An attempt is made to cost out the special precautions needed to reduce risk to a level which it is postulated that the

public (through the institution of government) would accept. These costs are related back to the discounted cost advantage of load-centre proximity for a plant of given size. The result is an assessment of the economic feasibility of metropolitan siting in today's climate of public understanding (and misunderstanding) about radiation risks and effects. (Houser-NSIC)
W71-10605

THE UNITED KINGDOM APPROACH TO THE APPLICATION OF ICRP STANDARDS TO THE CONTROLLED DISPOSAL OF RADIOACTIVE WASTE RESULTING FROM NUCLEAR POWER PROGRAMS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England), Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05C.
W71-10607

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1970,
Naval Ship Systems Command, Washington, D.C. Nuclear Power Directorate.
For primary bibliographic entry see Field 05A.
W71-10634

SUMMARY REPORT OF PLANS AND PROGRAMS FOR THE DEVELOPMENT OF WATER SUPPLY AND SEWAGE DISPOSAL FACILITIES IN THE LOWER PIONEER VALLEY.
Lower Pioneer Valley Regional Planning Commission, West Springfield, Mass.
For primary bibliographic entry see Field 06B.
W71-10783

SEWAGE DISPOSAL FACILITIES.
Lower Pioneer Valley Regional Planning Commission, West Springfield, Mass.

Available from the National Technical Information Service as PB-198 211, $3.00 in paper copy, $0.95 in microfiche. Prepared by Metcalf and Eddy, Inc, Palo Alto, Calif. March 1970. (222 p), 42 fig, 24 tab, append.

Descriptors: *Sewage disposal, *Treatment facilities, *Regional analysis, *Planning, Facility, Sewers.
Identifiers: *Regional planning, *Massachusetts, Sewer pipes, *Sewage disposal facilities.

The feasibility was investigated of providing water supply and waste water disposal services to various groupings of municipalities, or parts thereof, and to identify the advantages and disadvantages of each grouping. Data are presented on water supply and sewage disposal systems in the study area so that the Commission can utilize this information as an aid in making decisions regarding future development.
W71-10784

THE MARINE DISPOSAL OF SEWAGE SLUDGE AND DREDGE SPOIL IN THE WATERS OF THE NEW YORK BIGHT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W71-10800

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1970,
Naval Ship Systems Command, Washington, D.C., Nuclear Power Directorate.
For primary bibliographic entry see Field 05B.
W71-10809

CITY PUTS FARM TO MULTIPLE USE,
Office of Public Works, Kerrville, Tex.
John W. Woerner.
Public Works, Vol 102, No 3, p 57, March 1971, 1 photo.

Descriptors: *Landfills, *Waste water treatment, *Waste disposal, Compaction, Irrigation, Effluents.
Identifiers: *Multiple use, *Refuse, *Health, Kerrville, Texas.

Multiple use of a city-owned farm permits Kerrville, Texas to meet current waste disposal demands and to earn $5000 per year to offset the costs. 20 acres of the 325 acres are allocated to a landfill project, and it is calculated that this area should meet the waste disposal demands of the population for the next five years. Landfill operations occur in three trenches: a regular trench which receives daily refuse, a second trench which is assigned to bulky objects such as refrigerators, and a third trench which is for dead animals. Refuse is compacted, and the final cover is three feet. The landfill replaces the old city dump, thus eliminating a dangerous health hazard. Wastewater treatment occurs in a plant equipped with an Imhoff tank, a trickling filter, and an oxidation pond. Effluent is used for irrigation of pasture land. Irrigation of reclaimed sanitary landfill areas is also practiced. The City is working with County officials in an effort to develop a future landfill site. (Strachan-Chicago)
W71-10886

CRITERIA FOR SANITARY LANDFILL DEVELOPMENT,
Drexel Univ., Philadelphia, Pa.
R. L. Steiner, A. A. Fungaroli, R. J. Schoenberger, and P. W. Purdom.
Public Works, Vol 102, No 3, March 1971, p 77-79, 2 fig, 1 tab, 8 ref.

Descriptors: *Landfills, *Waste disposal, *Planning, *Water pollution sources, Environment.
Identifiers: *Criteria, *Development, Leachate generation, Health.

Solid waste disposal planning is being recognized as an important element of state and local public health programs as a result of 1965 Federal legislation, (The Solid Waste Disposal ct). Landfilling is the only final disposal technique, and consequently rational landfill criteria and procedures must be developed to protect the environment. The landfill can no longer be regarded as a technique applicable only for regionally and geologically isolated area. Present landfill standards, which are rigid and arbitrary, are sufficient for dust repression, vector control and site esthetics, but not sufficient for control of leachate generation and surface and water pollution. Each landfill site should be engineered to take advantage of site conditions so that it will not cause damage to the surrounding environment. If this approach is used, no rigid, irrational criteria will be applied. The most important criterion is that of public health. Future designs for sanitary landfilling should be based on performance criteria, and not design standards. (Strachan-Chicago)
W71-10887

SOLID WASTE DISPOSAL.
For primary bibliographic entry see Field 06E.
W71-10921

THE REFUSE ACT: ITS ROLE WITHIN THE SCHEME OF FEDERAL WATER QUALITY LEGISLATION.
For primary bibliographic entry see Field 05G.
W71-10922

SOLID WASTE.
For primary bibliographic entry see Field 06E.
W71-10925

REGULATING DISPOSAL OF SEWAGE AND LITTER.
For primary bibliographic entry see Field 06E.
W71-10929

COMPREHENSIVE STATEWIDE SOLID WASTE MANAGEMENT PLAN; POWERS AND DUTIES OF THE COMMISSIONER OF THE STATE DEPARTMENT OF HEALTH.
For primary bibliographic entry see Field 06E.
W71-10954

RULES AND REGULATIONS FOR SUBSURFACE DISPOSAL SYSTEMS.
Colorado Dept. of Health, Denver. Water Pollution Control Commission.
For primary bibliographic entry see Field 05G.
W71-10960

RULES FOR SITE LOCATION APPROVAL OF SEPTIC TANK SYSTEMS.
Colorado Dept. of Health, Denver. Water Pollution Control Commission.
For primary bibliographic entry see Field 05G.
W71-10963

5F. Water Treatment and Quality Alteration

ESTIMATION OF THE SURFACE WATER CONTAMINATION BY THE NEAR FALLOUT BY NUCLEAR EXPLOSIONS (In German),
Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany).
For primary bibliographic entry see Field 05B.
W71-10623

APPLICATION OF RADIOISOTOPES TO WATER RECOVERY SYSTEM FOR EXTENDED MANNED AEROSPACE MISSIONS,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05D.
W71-10797

DETECTION OF HIGHLY DILUTED VIRUSES IN WATER BY FLOCCULATION,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05D.
W71-10838

MULTISTAGE MARGINAL COST MODEL OF INVESTMENT-PRICING DECISIONS: APPLICATION TO URBAN WATER SUPPLY TREATMENT FACILITIES,
Cornell Univ., Ithaca. Dept. of City and Regional Planning.
Courtney Riordan.
Water Resources Research, Vol 7, No 3, p 463-478, June 1971. 16 p, 9 fig, 2 tab 18 ref.

Descriptors: *Marginal costs, *Investment, *Pricing, *Water treatment, *Planning, City planning.

An attempt was made to apply a previously developed model of investment-pricing decisions to the particular problem of choosing the timing and sizes of additions to capacity in urban water supply systems. On the basis of empirical data, typical but hypothetical cost and demand curves for water supply were defined and incorporated into the model. The model was then solved under varying assumptions with regard to rate of growth in demand, the level of the discount rate, and the length of the planning horizon. The results were compared in terms of their efficiency with results that could be expected from conventional approaches to the problem by employing certain arbitrarily assumed schemes of average cost pricing combined with rules of thumb criteria for choosing the timing of capacity investment. The conclusions

were that the empirical data necessary to effectively implement the general model in the water supply area were unavailable and the results suggested that the multistage marginal cost approach toward planning and operating urban water supply systems might be 10-20% more efficient than traditional average cost approaches. (Veverka-Cornell)
W71-10861

OPTIMAL PLANS FOR THE CAPACITY EXPANSION OF A MUNICIPAL WATER-TREATMENT-DISTRIBUTION SYSTEM,
Illinois Univ., Urbana. Dept. of Business Administration.
Hirohide Hinomoto.
WRC Research Report No 39, Water Resources Center, University of Illinois, Urbana, January 1971. 45 p, 5 fig, 7 tab, 33 ref, 1 append.

Descriptors: *Linear programming, *Treatment plants, *Reservoirs, *Water treatment, *Water distribution (Applied), *Economies of Scale, Costs, Optimization.
Identifiers: *Champaign-Urbana area.

An application of linear programming to the multi-stage capacity expansion of a municipal water treatment-distribution system, as applied to the Champaign-Urbana area, determined the sizes of treatment plants and distribution reservoirs and the points of time at which these facilities were installed. One of the salient points in capital investment is the economies of scale associated with large facilities. In this study, the scale effects were included in the capital and operating costs of facilities and given by concave functions of capacity. The original non-linear problem was transformed to a linear program by converting non-linear cost functions to linear functions in polygonal form. An optimal solution to the linear program was obtained by approximating an optimal solution to the original non-linear formulation. The plan provided useful information for specifying facilities to be installed early in the planning period, preparing the acquisition of construction sited for facilities to be installed, or raising funds required for such construction. (Veverka-Cornell)
W71-10866

5G. Water Quality Control

THE GROWTH OF OIL SLICKS AND THEIR CONTROL BY SURFACE CHEMICAL AGENTS,
Shell pipe Line Corp., Houston, Tex.
Robert A. Cochran, and Paul R. Scott.
Journal of Petroleum Technology, p 781-787, July 1971. 7 p, 10 fig, 2 tab, 9 ref.

Descriptors: *Oily water, *Path of pollutants, *Water pollution control, Chemcontrol, Surfactants, Oil wastes, Oil-water interfaces.
Identifiers: *Oil slicks, *Oil spills.

A calculation method for predicting the rate at which an oil slick will spread on water can also be used to predict the behavior of a slick that has been treated with a surface chemical collecting agent. Field and laboratory tests show that a small quantity of the agent can contain a slick for a considerable time. (Knapp-USGS)
W71-10451

WIND TUNNEL EXPERIMENTS ON OIL SLICK TRANSPORT,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 05B.
W71-10472

GOVERNMENTAL RESPONSIBILITIES FOR THE APPLICATION AND CONTROL OF TECHNOLOGY IN RELATION TO MAN'S ENVIRONMENT,
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 06E.
W71-10509

OUR TROUBLED WATERS: THE FIGHT AGAINST WATER POLLUTION,
Public Affairs Committee, Inc., New York.
Gladwin Hill.
Public Affairs Pamphlet No 462, 1971, 124 p, 7 photo.

Descriptors: *Water pollution, *Pollution abatement, *Pollutant identification, *Water supply, *Decision making, Planning, Natural resources, Waste disposal.
Identifiers: *Water contamination, *Pollution control, *Causes of pollution.

A discussion is presented of the causes of water pollution, reasons for the past and present apathy on the subject of water pollution, and legislation and other suggested methods of abating water pollution. Causes of water pollution result from: industry's use rather than consumption of water; chemicals, animal wastes, and irrigation damage from agricultural methods; contamination precipitated by rain and snow; and decaying vegetable and animal matter and silt from erosion, products of natural pollution. Pollution has become a tremendous problem as a result of a growing population and previous non-recognition of water pollution as primarily a resource problem. The Federal government has been unsuccessful in bringing about an abatement of water pollution for several reasons. (1) Until 1960 the conviction that waterways were the natural means of removing waste persisted in industry, government, and among the general public. (2) In the absence of explicit legal mandates, industries resisted 'non-productive' expenditures for pollution control. (3) Municipalities could not raise money to correct inadequacies in sewage facilities. (4) The public remained ignorant of proper sewage treatment. (Strachan-Chicago)
W71-10521

WATER QUALITY MANAGEMENT PLAN FOR THE BLACK RIVER BASIN.
Ottawa County Board of Commissioners (Ontario).

Bauer Engineering, Chicago, Illinois, December 1970, 141 p, 31 tab, 23 exhibit, append.

Descriptors: *Water policy, Natural resources, Decision making, Basins, *Water resources development, *Water quality control, *Planning.
Identifiers: *Water quality management, *Water resources planning, Water supply systems, Planning framework, Black River Basin, Ottawa County, Basin hydrology, Community consensus.

A planning framework for water resources management in the Black River Basin, Ottawa County, Michigan, is examined. Community involvement in the planning process is seen as vital to its success. An encompassing survey was made of influential community decision makers, resulting in an analysis of the study to identify the leaders and understand the decision-making structure. Descriptive accounts are given of the development of the basin since 1930, including population trends, physical characteristics, and basin hydrology. The quantitative information on the use, management, and state of the Black River Basin water resource systems is synthesized to establish a basis for future management systems and policy needs. Various reports, data, surveys and personal contacts form the basis of the assessments made. Improvement of water quality will require a more comprehensive management program and one with a greater level of program coordination. Specific water quality improvement plans of the City of Holland are explained. An early action plan leading to comprehensive land and water management is outlined. The area of immediate need for water resource management is the development of a community consensus for future action and an organizational structure for program coordination and decision making. (Wray-Chicago)
W71-10522

MAINTAINING WATER QUALITY,
National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 05C.
W71-10550

SALTON SEA, CALIFORNIA--WATER QUALITY AND ECOLOGICAL MANAGEMENT CONSIDERATIONS,
Federal Water Quality Administration, San Francisco, Calif. Pacific Southwest Region.
R. C. Bain, A. M. Caldwell, R. H. Clawson, H. L. Scotten, and R. G. Wills.
Federal Water Quality Administration Pacific Southwest Region Report, July 1970. 54 p, 15 fig, 10 tab, 16 ref.

Descriptors: *Surface waters, *Sea water, *Water quality, *Ecology, *California, Hydrologic data, Chemical analysis, Data collections, Nutrients, Salinity, Sediments, Eutrophication, Fish, Algae, Recreation, Environmental effects, Invertebrates, Water resources development.
Identifiers: *Salton Sea (Calif), Ecological management.

This report presents data related to salinity and nutrient related problems and control measures to alleviate adverse water quality conditions in the Salton Sea. The Salton Sea lies in a low-lying desert sink area approximately 85 miles east of San Diego, California. Formed in 1905-06, the 230,000 acre sea is threatened with rapidly rising salinity levels which if uncontrolled are expected to eliminate the currently valuable sport fishery within the next decade. Fluctuating water levels and eutrophication symptoms, such as dissolved oxygen deficiencies in deeper waters, discolorations and turbidity of the water and offensive odors caused by dense phytoplankton populations, are also major Salton Sea problems. An annual inflow of approximately 1.2 million acre feet principally from the New and Alamo Rivers brings salts, nutrients, pesticides and fecal bacteria to the Sea. Much of this water is agricultural drainage from the Imperial Valley and sewage from Valley Communities and from Mexico. Evaporation losses within the Salton Sea approximate annual inflow. Thus a hydrodynamic balance exists. Recent data show salt levels are approximately equal to oceanic salinity although ionic composition is somewhat different. (Woodard-USGS)
W71-10577

DURNING V ITT RAYONIER INC (QUI TAM ACTION UNDER REFUSE ACT).
For primary bibliographic entry see Field 06E.
W71-10582

U.S.A. REGULATIONS FOR THE CONTROL OF RELEASES OF RADIOACTIVITY INTO THE ENVIRONMENT IN EFFLUENTS FROM NUCLEAR FACILITIES,
Atomic Energy Commission, Washington, D.C.
L. Rogers, and C. C. Gamertsfelder.
Availability: Unipub, P.O. Box 433, New York, N.Y. 10016. Proceedings of IAEA-SM-146-8, Aug. 1970, p 127-45, 1 fig, 6 tab, 2 appendixes.

Descriptors: *Radioactivity, *Nuclear power plants, *Effluents, *Control, *regulation, Permits, Standards, Liquids, Gases, Ecology, Hydrology, Meteorology, Aquatic population, Ecosystem.
Identifiers: Nuclear facilities, USAEC, FRC, ICRP, NCRP, License, Codes and Standards.

Releases of radioactivity in air and water effluents from nuclear facilities are regulated under the provisions of the USAEC's regulations, Parts 20 and 50. The basic considerations are described in translating into regulatory limits the radiation guides recommended by the Federal Radiation Council (FRC) and approved by the President, the recommendations of the National Council on

Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP). Limits are discussed on concentrations and/or quantities of radioactivity that may be released in effluents from nuclear facilities and how these limits are applied to take into account all important pathways of exposure so as to assure that exposures to the public remain well within FRC radiation protection guides. Operating experience is reviewed which shows that radioactivity in water and air effluents from nuclear power reactors has generally been less than a few per cent of the limits specified in Part 20 and exposures to the public in the immediate vicinity of operating power reactors have usually been small fractions of FRC guides. Also discussed are recent proposed amendments to the Commission's regulations in Parts 20 and 50 to improve the regulatory framework for assuring that reasonable efforts are made to keep exposures to radiation and releases of radioactivity in effluents as low as practicable, consistent with FRC guidance. (Houser-NSIC)
W71-10606

UNITED STATES V BARGE BOULDER.
For primary bibliographic entry see Field 06E.
W71-10610

UNITED STATES V SS MORMACSAGA (VESSEL'S LIABILITY FOR REFUSE DISCHARGE IN NAVIGABLE WATERS).
For primary bibliographic entry see Field 06E.
W71-10621

VERIFICATION OF MODELS AND BASIC DATA USED IN THE MANAGEMENT AND CONTROL OF WATER QUALITY,
Washington State Univ., Pullman. Water Research Center.
B. W. Mar.
Available from the National Technical Information Service as PB201 653, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June 1971, 51 p, 7 fig, 10 tab, 14 ref.

Descriptors: Water quality, Discharge (Water), *Water quality control, *Model studies, *Data collections, *Management, Decision making, Water pollution control, Evaluation.
Identifiers: Water quality data, *Discharge rights.

A research program was conducted to evaluate data and models used in water quality management analysis and to evaluate a 'discharge right' concept for water quality management with these tools. Twelve separate reports have been prepared to support the conclusions of this study; they are summarized in this completion report. An analytical framework is presented with summarized waste generation coefficients, economic data, and fundamental equations for use in this framework. Alternative information systems are reviewed and evaluated for use in the analytical framework. It was concluded that the status of water quality modeling is limited by hydrologic, hydraulic, economic and demographic data rather than by waste assimulation information. Furthermore, it was observed that application of models to water quality decision making is minimal, with most effort being of an academic nature. The application of modelling technology to assess a 'discharge right' management policy indicated that such an alternative method of control can reduce adjustment problems in reallocation of waste loads, but will not reduce the responsibility of government to provide management.
W71-10646

FLEXIBLE HOLDING TANK FOR PLEASURECRAFT SANITARY SYSTEMS,
Uniroyal, Inc., Wayne, N.J. Research Center.
Mark W. Olson.
Copy available from GPO Sup Doc, $0.55 in paper copy; microfiche from NTIS as PB-201 700, $0.95. Water Pollution Control Research Series, August 1970, 45p, 12 fig, 3 tab, append. EPA Program 15020 DGR 8/70.

Descriptors: *Recreation wastes, *Sewage disposal, Boats, Dimensions, *Storage capacity, Design criteria, Quality control, Evaluation, Reservoir, Plastics, Pollution abatement, Elastomers, Water pollution control, *Waste storage.
Identifiers: *Holding tank, Accordion pleats (Corrugations).

The problem of increasing numbers of small pleasurecraft and resulting increases in the pollution problems resulting from the sanitary wastes from these crafts has caused much concern. Formerly the waste from these crafts was dumped into the surrounding water causing major pollution difficulties. Of of the several possible means of handling sanitary waste from small pleasurecrafts, the most direct would be storing of the waste until it could be disposed of on shore, perhaps after treatment. One of the main problems in development of such a disposal system in small crafts is the probable lack of space for installation of a holding tank. A means of overcoming this obstacle has been sought through the use of a flexible holding tank which could allow for installation in hidden and almost inaccessible places with a minimum of structural changes. The design criteria calls for an accordion-pleated tank to be made of elastomer coated nylon fabric with ten 60 v-shaped pleats with a cross section of 14 inch by 24 inch and holding about 18 gallons of fluid. This tank could collapse to fit a much more restrictive space and can actually expand to 21 inches to provide collapse to fit a much more restirctive space and can actually expand to 21 inches to provide a capacity of nearly 25 gallons. The results showed that a tank of the specified materials provides an acceptable and versatile holding tank for upgrading a sanitary system on small pleasurecraft, particularly in the 22 to 28 foot length. (Adkins-Texas)
W71-10652

VORTEX SEPARATION FOR OIL SPILL RECOVERY SYSTEMS.
American Process Equipment Corporation, Panama City, Florida.

Copy available from GPO Sup Doc, $0.60 in paper copy; microfiche from NTIS as PB-201 656, $0.95. Water Pollution Control Research Series, October 1970, 54 p, 10 fig, 4 tab, 3 ref, 7 append. EPA Program 15080 EUU 10/70.

Descriptors: *Oil-water interfaces, *Separation techniques, *Vortices, Oily water, Pollution abatement, Design criteria, Analytical techniques, Specifications, *Skimming, Storage, Mixing, Suspension, Quality control, Water purification, Water pollution control, Waste water treatment, Oil wastes.
Identifiers: Oil spills, Sweeping, *Vortex separation process.

In recent years the subject of oil spills, such as resulted in the cases of the Torrey Canyon and the Santa Barbara Channel as well as numerous minor accidents during the last few years, has become of increased public interest. The demand for quick, effective solutions to the problem has brought about extensive programs for the development of equipment and technology for the safe, fast and efficient recovery of spilled oils from water. Research was begun to develop a full scale prototype oil/water separator, potentially capable of filling the need for a continous, rapid, efficient oil/water separator, operable in choppy to moderately heavy seas, and capable of separating low concentration oil/water mixtures into recovered oil nearly free of water and clear water suitable for return to sea. The result of the research showed that a simple vortex separation process is an efficient method of separating and can rightfully be incorporated into a total oil recovery system comprising sweeping-skimming-separation storage. Better than 99.5% of influent oil was recovered from mixtures with water of 1-10% oil. Recovery of 90% was obtained with influents containing only 0.1% oil. Effluent quality in the range of 100 to 200 ppm was reproducibly achieved. A functional gimbal stand and flexible hose connections were used in the full-scale portotype demonstrations. (Adkins-Texas)
W71-10653

ECONOMIC PRINCIPLES OF LIABILITY AND FINANCIAL RESPONSIBILITY FOR OIL POLLUTION,
Center for Naval Analysis, Arlington, Va.
Stanley Horowitz.
Available from the National Technical Information Service as AD-722 376, $3.00 in paper copy, $0.95 in microfiche. Professional paper 56, March, 1971, 25p.

Descriptors: *Water pollution, *Oil wastes, *Legal aspects, *Economics, Costs, Drilling, Offshots platforms.
Identifiers: Tankers, *Oil pollution, Government policies, Insurance, Offshore drilling.

The paper examines the economic issues involved in the imposition of liability for the damages caused by disasters in general and major oil spills in particular. The conclusions reached are the following: Unlimited liability with absolute fault is to be preferred to limited liability when one takes the welfare of society as a whole into account. It may be desirable to levy fines on polluters above payment of damages. Oil companies do not have a right to carry on polluting activities; and the government should make certain that financial responsibility is provided for.
W71-10671

OIL POLLUTION LIABILITY AND FINANCIAL RESPONSIBILITY. A REPORT TO THE PRESIDENT AND THE CONGRESS.
Coast Guard, Washington, D.C.

Available from the National Technical Information Service as PB 198 775, $3.00 in paper copy, $0.95 in microfiche. Report, December, 1970, 18p.

Descriptors: *Water pollution, *Oil wastes, *Economics, *Legal aspects, Damages, Abatement, Water pollution control.
Identifiers: *Economic analysis, *Government policies, Water pollution, Jurisprudence, Water pollution, Marine transportation, Petroleum transportation, Cleaning, Oil storage, Offshore drilling, Water Quality Improvement Act.

The report summarized a study on the need for measures to provide financial responsibility and limitation of liability for vessels, onshore and offshore facilities for costs of removing discharged oil and payment of damages resulting from the discharge. The report recommends to the President and to the Congress no change in liability for vessels, federal preemption for vessels in interstate commerce, and that varying schedules of proof of financial responsibility of onshore and offshore facilities be established based on the pollution potential of the facility.
W71-10672

MEASURES OF THE POTENTIAL ECONOMIC LOSS FROM OIL POLLUTION,
Center for Naval Analyses, Arlington, Va.
Richard A. Kuzmack.
Available from the National Technical Information Service as AD-722 378, $3.00 in paper copy, $0.95 in microfiche. Professional paper 67, 15 March 1971, 13p.

Descriptors: *Water pollution, *Oil wastes, *Beaches, *Economics, Mathematical models, Coasts, Cities.
Identifiers: *Oil pollution, Economic models, *Santa Barbara, California, *Galveston, Texas.

The specific problem addressed is that of empirically estimating the potential impact of a large scale oil spill into the public waters on the economy of a nearby coastal community. Taking two areas as case studies, the sensitivity of their economies to exogenous changes in income is estimated using an economic base model. The potential loss is then calculated from the amount of income directly susceptible to oil pollution damages.
W71-10673

REGIONAL CONTROL OF AIR AND WATER POLLUTION IN THE SAN FRANCISCO BAY AREA,
Doug Haydel.
California Law Review, Vol 55, No 3, p 702-727, 1967, 26 p, 209 ref.

Descriptors: *California, *Administrative agencies, *Pollution abatement, *Standards, Regulation, Water zoning, Abatement, Control, Inspection, Legal aspects, Permits, Water policy, Water control, Water pollution, Public health, Water quality, Water pollution treatment, Water pollution control, Water quality control.

Regional control of air and water pollution in the San Francisco Bay Area is considered, with emphasis upon the effectiveness of administrative agencies. The problems of air pollution in the area are discussed, with attention focused upon the Bay Area Air Pollution Control District and the California Motor Vehicle Pollution Control Board. Control of water pollution in the Bay Area is achieved through the activities of regional agencies. The results achieved through this regional control system demonstrate the success of such a system. Principal control powers are vested in nine regional water quality control boards covering the entire state. The San Francisco Bay Regional Water Quality Control Board exercises control over water pollution in the nine Bay Area counties by issuing requirements for waste discharges. Any person proposing to discharge wastes, other than through a community sewer system, must file a report with the board, after which discharge requirements are established for the proposed discharge. The successes and failures of this board in controlling water pollution are discussed, with recommendations given for future improvement. The State Water Quality Control Board is also considered. (Horwitz-Florida)
W71-10676

AGRICULTURE AND THE POLLUTION PROBLEM,
Joseph C. Street.
Utah Law Review, Vol 1970, No 3, p 395-403, 1970, 9 p, 16 ref.

Descriptors: *Farm wastes, *Agricultural chemicals, *Fertilizers, *Water pollution sources, Domestic wastes, Pesticides, Farm prices, Economics, Adoption of practices, Agricultural watersheds, Septic tanks, Organic wastes, Water pollution effects, Eutrophication, Water pollution, Stagnant water, Water quality control, Phosphates, Wastes, Regulation, Water pollution control.

Agricultural practices are contributing significantly to environmental pollution. Animal and domestic wastes have a pronounced pollutive effect, especially when discharged directly into rivers and streams. Such discharges raise the nitrogen and phosphorus levels of the water and may result in increased concentrations of disease organisms and undesirable eutrophication of ponds and lakes. In addition, there is the problem of domestic wastes from rural homes, most of which are not equipped with advanced septic systems. The discharge of organic waste matter from the industrial processing of agricultural commodities raises the biochemical oxygen demand of the water into which it is discharged. Over-application of fertilizer and consequent excessive nutrient leaching or loss by run-off is another problem. A small increase in the concentration of phosphorus from fertilizers may result in an algae-bloom and eventually a fouled, oxygen-deficient, stagnant system. Regulations have been put forth in attempts to maintain the quality of the country's waters, but the small producer has not yet been compelled to comply because of lack of resources for enforcement and the small farmer's inability to absorb the added costs. (Johnson-Florida)
W71-10678

OHIO RIVER SAND CO V COMMONWEALTH.
For primary bibliographic entry see Field 06E.
W71-10680

EMERGENCY ACTIONS (WATER POLLUTION CONTROL PROCEDURES).
Georgia Water Quality Control Board, Atlanta.
For primary bibliographic entry see Field 06E.
W71-10682

WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-10685

MUNICIPAL POWERS--WATER POLLUTION AND WASTE DISPOSAL AND WATER SUPPLY SYSTEMS.
For primary bibliographic entry see Field 06E.
W71-10686

A REVIEW OF THE 1970 LITERATURE ON WASTE WATER AND WATER POLLUTION CONTROL.

Journal Water Pollution Control Federation, Vol 43, No 6, Jun 1971. 496 p.

Descriptors: *Reviews, *Bibliographies, *Water pollution control, *Water pollution effects, *Water pollution treatment, Water reuse, Heavy metals, Oily water, Sludge, Activated sludge, Anaerobic digestion, Biology, Biochemistry, Chemistry, Water chemistry, Acid mine water, Detergents, Disinfection, Estuaries, Eutrophication, Ships, Groundwater, Industrial wastes, Sea water, Oceans, Dissolved oxygen, Radioactive wastes, Water management (Applied), Thermal pollution.
Identifiers: *Mercury.

This review covers 1970 literature on analytical methods, biological filters, activated sludge, detergents, anaerobic processes, sludge treatment, disinfection, water reclamation and reuse, storm flow, facility evaluation, physical and chemical methods, lagoons and oxidation ponds, effects of pollution on aquatic life, eutrophication, thermal pollution, microbiology, oxygen sag, groundwater, marine and estuarine pollution, mercury and oil pollution, economics of treatment, standards, law, systems analysis, and industrial wastes. (See also W71-10692 thru W71-10697) (Knapp-USGS)
W71-10691

ROUTINE ANALYTICAL METHODS,
For primary bibliographic entry see Field 05A.
W71-10692

COAL, COAL BY-products, and COAL MINE DRAINAGE,
For primary bibliographic entry see Field 05B.
W71-10694

WATER POLLUTION BY OIL SPILLAGE,
For primary bibliographic entry see Field 05B.
W71-10695

ECOLOGICAL EFFECTS OF OIL POLLUTION,
For primary bibliographic entry see Field 05C.
W71-10696

ACCUMULATION OF MERCURY AND ITS COMPOUNDS,
For primary bibliographic entry see Field 05B.
W71-10697

DIVISION OF SANITARY ENGINEERING (POWERS AND DUTIES OF THE PENNSYLVANIA DIVISION OF SANITARY ENGINEERING).
Pennsylvania Sanitary Water Board, Harrisburg.
For primary bibliographic entry see Field 06E.
W71-10735

THE CANADIAN ARCTIC WATERS POLLUTION PREVENTION ACT: AN ANALYSIS,
Burt K. Carnahan.
Louisiana Law Review, Vol 31, No 4, p 632-649, 1971. 18 p, 100 ref.

Descriptors: *Arctic Ocean, *Water pollution, *International waters, *Jurisdiction, Pollution abatement, Water pollution control, Oil, Oil industry, Water pollution sources, Pollutants, Ships, Polar regions, Foreign countries, International law, Disasters, Treaties, Water pollution effects, Legislation, Legal aspects, Coasts, Continential shelf, Ice, Environmental effects.

Due to recent oil discoveries in the arctic region, the possibility of an oil shipping lane through the Northwest Passage of Canada has been suggested and attempted. Canada, in response to fears of a destructive oil spill in arctic waters, promulgated the Arctic Waters Pollution Prevention Act. Canada unilaterally asserted its right as a coastal state to protect its mainland shores and arctic territories from the potentially destructive effects of marine pollution. A contiguous zone for the regulation of pollution was created. An analysis is provided of this claim order to postulate standards by which such unilateral extensions of jurisdiction over maritime areas may be judged in the future. Various Canadian jurisdictional claims over arctic waters are discussed. International anti-pollution controls contain certain serious inadequacies. The provisions of the Act are outlined and justification is provided for its international legality. Three criteria are suggested in judging unilateral jurisdictional claims: (1) the scope of the powers claimed; (2) the area of asserted authority; and (3) the purpose of the disputed measure, based on a functional test. Until a general maritime regime is created, nations must act themselves to prevent environmental pollution. (Smiljanich-Florida)
W71-10737

USE DESIGNATION AREAS FOR MICHIGAN'S INTRASTATE WATER QUALITY STANDARDS.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 06D.
W71-10738

WATER QUALITY STUDY OF THE FLINT RIVER.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 05B.
W71-10741

MUST DESTRUCTIVE DEGRADATION COME TO THE WATERS OF THE DELTA AND SAN FRANCISCO BAY.
Contra Costa County Board of Supervisors, Martinez, Calif.
For primary bibliographic entry see Field 06G.
W71-10745

THE SACRAMENTO-SAN JOAQUIN DELTA ---- WHY THE CONTROVERSY,
Contra Costa County Water Agency, Martinez, Calif.
Jack Port.

A paper presented by the Contra Costa County Water Agency at a study session of the Northern Calif. Regional Conservation Committee of the Sierra Club, June 22, 1968, Vallejo, California. June 22, 1968. 33 p, 2 fig.

Descriptors: *Agricultural engineering, *Saline water intrusion, *Deltas, *Water quality control, *Estuarine environment, Saline water-freshwater interfaces, Estuarine fisheries, Nutrients, Planning, Eutrophication, Water supply, Watershed management, Water circulation, California, Recreation.
Identifiers: *Sacramento - San Joaquin Delta, San Luis Drain, State Water Project, Central Valley Project, Peripheral Canal.

This statement discusses in a general manner some of the controlling factors and consider suggested solutions to the problems of the Sacramento-San Joaquin Delta. Of all the factors most seriously affecting the Delta, the most controlling is the hydrology of this area. The Delta is especially unique because of the past and present predominance of its fresh water environment which is entirely dependent upon the amount of Delta outflow contributed by the streams of the Sacramento-San Joaquin Basin. The greater the flow westerly past Antioch and Pittsburg, the greater the force available for repulsion of ocean water. The proposed operation of the State Water Project and the Central Valley Project would move the 1,000 parts per million chloride-ion concentration line nine miles upstream from Antioch and interfere with agriculture in the Western Delta. Protection of the fishery habitat in the Delta channels and sloughs is also a potent problem. The entire controversy over the Delta rests upon the amounts of Delta outflow required to maintain and protect the Delta's environment. The effects of the San Luis Drain and the proposed Peripheral Canal upon the Delta and Contra Costa County's 'Delta Water Quality Criteria' are also discussed. (Poertner)
W71-10747

FREE VORTEX RECOVERY OF FLOATING OIL, CONCEPT FEASIBILITY STUDY,
Scientific Associates Inc, Santa Monica, Calif.
Paul G. Mikolaj, Eugene B. Nebeker, and Sergio E. Rodriguez.
Available from the National Technical Information Service as AD-723 599, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Contract Feasibility Study, 74103/A/003, Sept. 1970, 112p.

Descriptors: *Oil wastes, *Water pollution sources, *Feasibility studies, *Water pollution control, Pumps, Test procedures, Vortices.
Identifiers: *Oil spills, *Vortex generators, *Oil pollution, Skimmers.

A concept employing a free vortex for use in recovering oil from high seas oil spills is presented. An oil slick will migrate toward the center of the vortex due to the action of the water flow induced by an impeller. At an appropriate speed of rotation, the oil will submerge and accumulate within a central region of the vortex. This pocket will contain a concentrated mass of oil which can readily be removed by conventional pumping. Advantages of this technique include effective operation in high seas and the ability to both collect and concentrate the oil in a single operation. Following a series of laboratory experiments to establish the magnitude of key operating parameters, a free vortex oil recovery model was designed and constructed. Final testing and data collection were done in a model basin capable of providing deep water waves. Performance data were obtained both under quiescent water conditions and also under environmental conditions that simulated 10-foot waves, 40 miles per hour winds, and 2-knot currents. Detailed scaling considerations based on the data obtained during model testing indicated that a full-scale prototype would be operable in all 10-foot seas which can realistically be encountered in actual situations. Based on this model test data, the prototype will recover in excess of 100 gpm of oil with an oil-to-water ratio greater than 1.5 when operating with a crude oil film only 0.1 inches thick.
W71-10762

CONTROL OF HAZARDOUS POLLUTING SUBSTANCES.
Coast Guard, Washington, D.C.

Available from the National Technical Information Service as PB-199 193, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Report and study under the Federal Water Pollution Control Act, HPS-2, 20 October 1970, 217p.

Descriptors: *Oil wastes, *Water pollution sources, *Water pollution control, Air pollution, Regulation, *Abatement, Legal aspects, Waterways, Water pollution effects, Hazards, Accidents.
Identifiers: *Hazardous materials, *Water transportation, Water pollution, Control, Industrial wastes, Sewage, Recommendations, Public health, Aquatic biology, *Water pollution detection, *Oil pollution.

Pursuant to Section 12 (g) of the Federal Water Pollution Control Act, as amended by the Water Quality Improvement Act of 1970, an accelerated study was conducted into the methods and measures for controlling hazardous substances to prevent their discharge, the most appropriate measures for enforcement, and recovery of costs if removal is undertaken by the United States. Water, air, and land pollution are inextricably interwoven; however, the study was constrained to consider only the water pollution aspect. Focus was placed on accidental spills and effluent discharges in excess of those authorized. This study supports a report on the need for legislation to impose liability and financial responsibility requirements for the cost of removal of hazardous substances discharged from vessels and onshore and offshore facilities. During the study contact was made with representatives of the manufacturing industry and of the several surface transportation modes, with Federal and State officials, with municipal representatives, and with public and private groups. As part of this extensive effort a three-day symposium on hazardous polluting substances was conducted. (An abstract of this symposium is available from NTIS, the accession number being PB 195 342). In addition, the study includes an extensive bibliography.
W71-10764

A FEASIBILITY STUDY OF THE USE OF THE OLEOPHILIC BELT OIL SCRUBBER,
Shell Pipe Line Corp., Houston, Tex. Research and Development Lab.
Robert A. Cochran, Warren T. Jones, and James P. Oxenham.
Available from the National Technical Information Service as AD-723 598, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Technical report 71403/A/002, October, 1970, 184p.

Descriptors: *Oil wastes, *Water pollution, Control, *Water pollution sources, *Mathematical models, Films, Ocean waves.
Identifiers: *Oil spills, Absorption, Oceans, Wind test methods, *Oil pollution, *Belt conveyors, Oleophilic belts, Skimmers.

This paper is the result of an integrated program of mathematical modeling and experimentation undertaken at the Shell Pipe Line Corporation Research and Development Laboratory to develop an understanding of the oleophilic belt 'Oil Scrubber' concept which would allow prediction of the performance of proposed large scale prototype devices. The parameters which govern the maximum oil recovery rates possible with such devices are identified, and their relative importance established. It is concluded that the maximum oil recovery rate of an oleophilic belt oil scrubber is generally limited by the rate at which oil can be transferred from the water surface to the belt surface and interior. Further, the 'Oil Scrubber's' performance is not detrimentally affected by the action of waves or limited presence of solid materials. The stability of the belt in a transverse flow is identified as a primary concern for operations in the presence of currents. Data are presented in a dimensionless form which facilitates the prediction of the performance of large devices of various belt geometries. It is shown that a single large belt is not a practical means of cleaning up large thin slicks in a short period of time, as belts of extreme length are required. The use of smaller, multiple belts is suggested. The feasibility study has not uncovered any technological constraints that would prevent operation of a prototype oleophilic belt system at the target environmental conditions, i.e., 40 knot winds, 10 foot waves, and 2 knot currents.
W71-10765

ENGINEERING FEASIBILITY STUDY OF THE BISHOP SYSTEM FOR OPEN OCEAN OIL SPILLS.
Bishop (William R) and Associates, San Francisco, Calif.

Available from the National Technical Information Service as AD-723 600, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Technical report 71403/A/006, 25 Nov 1970, 89p.

Descriptors: *Oil wastes, *Water pollution control, *Feasibility studies, *Water pollution sources, Test procedures, Skimming, Costs, Films.
Identifiers: *Oils recovery, Ships, *Oil pollution, *Bishop oil removal system, Oil spills.

An Engineering Feasibility Study on the BISHOP SYSTEM indicated effectiveness for ocean operation at low cost with capability of removing all types of oil spills from ocean surface. The system consists of a buoyant apparatus, 21 feet wide, propelled ahead of a support vessel, which closely tracks the sea surface to remove the oil film. Hydraulic pumping capacity is 5000 gpm and system is capable of operating at 4 Knot speed and up to Sea State 4 at reduced speed. Calculated system effectiveness is 240 Barrels per hour for 1/16 inches thick oil film in smooth water at 4.0 Knots. System efficiency is 5% oil to water picked up for a 1/16 inches oil film and 100% for a 1 inch oil film. Cost factors for skimming 1/16 inches oil film in smooth water have been estimated at $0.50/Bbl.
W71-10766

OBSTRUCTION AND POLLUTION OF WATERCOURSES--CRIMINAL OFFENSES.
For primary bibliographic entry see Field 06E.
W71-10770

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA,
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 06B.
W71-10772

APPLICATION OF A LARGE SCALE NONLINEAR PROGRAMMING ALGORITHM TO POLLUTION CONTROL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
G. Graves, D. Pngry, and A. Whinston.
Available from the National Technical Information Service as AD-721 296, $3.00 in paper copy, $0.95 in microfiche. Sponsored Paper, Army Research Office, Feb 1971. 56 p.

Descriptors: *Mathematical models, *Water quality control, *Water pollution control, *Streams, Estuaries, *Model studies.

Identifiers: *Nonlinear programming, Algorithms, Differential equations, Matrix algebra, Interations, Convergence, *Stream pollution.

During the past decade several models have been constructed which use the techniques of mathematical programming to select the least-cost solution to the problem of river and estuary pollution. The development of these models has been based on the explicit consideration of a river as an interrelated system with regard to water quality. The recognition of the nature of this system has allowed, in a theoretical context, large reductions in the total treatment costs in a river basin. A model is presented which adequately considers all important treatment alternatives available and describes their effects on water quality.
W71-10799

INSTITUTIONS OF EFFECTIVE MANAGEMENT OF THE ENVIRONMENT, PART I.
National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Board.
For primary bibliographic entry see Field 06E.
W71-10802

CONCEPT DEVELOPMENT OF A PROTOTYPE LIGHTWEIGHT OIL CONTAINMENT SYSTEM FOR USE ON THE HIGH SEAS,
Johns-Manville Research and Engineering Center, Manville, N.J.
David P. Hoult, Ralph H. Cross, Jerome H. Milgram, E. George Pollak, and H. John Reynolds.
Available from the National Technical Information Service as AD-723 601, $3.00 in paper copy, $0.95 in microfiche. Final report, June 1970. 282 p, 53 fig, 12 ref.

Descriptors: *Oil wastes, *Water pollution sources, *Water pollution control, Mathematical models, *Barriers, Model studies.
Identifiers: *Oil spills, Oceans, Recovery, Material removal, Model tests, *Water pollution equipment, *Barriers, Computerized simulation.

As part of a federal program to develop control measures for oil spills, the United States Coast Guard initiated a two stage procurement plan in 1969 for an oil containment system for use on the high seas. The first stage consisted of a competitive research program by several firms under separate commission to develop a concept for the system. The second stage is intended to permit the detail design, construction, and evaluation of a full-scale prototype system. This presentation describes the first stage development program by Johns-Manville Products Corporation, one of the participating firms in the competitive program. This system concept is based upon utilization of a physical barrier to confine spilled oil in as small an area as possible to permit effective removal procedures. Some of the methods which were used to develop the concept are described such as small-scale modeling in the laboratory, mathematical analyses, computer simulation techniques, logistical analyses, and scale model field tests. Included in the presentation is a summarized proposed plan for the detailed design of the system in the second stage effort.
W71-10803

GAS TAR, THROWING INTO PUBLIC WATER (PROHIBITION AGAINST).
For primary bibliographic entry see Field 06E.
W71-10805

FURTHER THOUGHTS ON TRADE EFFLUENT CHARGES,
Nottingham Sewage Disposal Dept. (England).
For primary bibliographic entry see Field 05D.
W71-10842

LEASES OF STATE LANDS FOR OIL AND GAS PRODUCTION.
For primary bibliographic entry see Field 06E.
W71-10851

COSTS FOR EQUIVALENT UPSTREAM REDUCTION IN WASTE WATER DISCHARGES,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
James P. Heaney, Buford J. Carter, and Edwin E. Pyatt.
Water Resources Research, Vol 7, No 3, p458-462, June 1971. 5 p, 2 fig, 1 tab, 11 ref.

Descriptors: *Waste water treatment, *Upstream, *Reduction (Chemical), *Costs, Biochemical oxygen demand, Optimization.

An analysis of the trade-off between more intensive upstream BOD removal and BOD removal at the point of discharge was presented for a regional river system. The purpose of the analysis was to provide an improved understanding of the interactions among these interrelated decison making units. The relationship between the marginal cost of waste treatment at the point of discharge and the marginal cost of more intensive waste treatment upstream was explored. The optimal solution was analyzed from the point of view of comparing the efficacy of increased upstream treatment. As the value of upstream waste treatment to the individual discharger diminished, the further upstream one moved. A relationship for evaluating this trade-off was presented. Possible alternative situations in a regional system were then analyzed. An application of the analysis to a hypothetical region was presented. (Veverka-Cornell)
W71-10860

POWER OF OPTIMIZATION FOR PRESCRIBED THERMAL POLLUTION,
Newark Coll. of Engineering, N.J.
Amir N. Nahavandi, and Michael Pappas.
Proceedings, American Society of Civil Engineers, Journal of the Power Division, Paper 8254, No PO 3, p 631-647, July 1971. 17 p, 7 fig, 1 tab, 6 ref, 3 append.

Descriptors: *Thermal pollution, *Optimization, Water pollution, Thermal power plants, Streams, Rivers.

The optimum design of a condenser cooling system for stream power plants required the maximization of plant power subject to a prescribed temperature rise at the immediate point of effluent discharge into the main water source. To achieve this objective with a relatively small condenser pumping capacity, a portion of the total flow was first passed through the condenser and then mixed with the unheated water before final discharge into the water source. A portion of the condenser discharge generally recirculated upstream, mixed with a portion of the incoming flow, and eventually entered the condenser intake manifold after having heat transfer with the atmosphere. The study showed that this general procedure did not provide the maximum power and was accompanied with a loss of plant power. To increase the plant power capability, it was necessary to prevent the mixing of the recirculation and the incoming flows and also to establish a relationship between the recirculation and the condenser flows. (Veverka-Cornell)
W71-10868

PUBLIC PERCEPTIONS OF WATER QUALITY,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
Elizabeth L. David.
Water Resources Research, Vol 7, No 3, p 453-457, June 1971. 5 p, 2 ref.

Descriptors: *Water quality, *Pollutant identification, *Surveys, *Social aspects.
Identifiers: Lake Michigan, Fox River.

A survey was made of a representative sample of adults in Wisconsin as to their description of pollution. The respondents were selected to be representative of both the urban complexes (along Lake Michigan from the Illinois border to Milwaukee) and the more rural areas of the state. The analysis of the data was of three general types: cross-tabulations, automatic interaction detector analyses, and multivariate (regression) analyses. Most respondents were concerned with the recreational aspects of water. When asked what would indicate pollution in water, 40% of the respondents chose scum and algae, 25% chose suds and foam and 20% chose dark, murky water. Only 1% mentioned cans and glass, 3% said weeds, and 10% said debris. Less mentioned were chemicals or disease germs that are not detected by the human sensory system. A table was provided which indicated percentages of responses defining pollution in terms of given water attributes. (Veverka-Cornell)
W71-10869

LAND TREATMENT AND WATER QUALITY CONTROL,
Colorado State Univ., Fort Collins. Dept. of Recreation and Watershed Resources.
J. R. Meiman, and S. H. Kunkle.
Journal of soil and water conservation, Vol 22, No 2, p 67-70, March-April 1967, 8 fig, 5 tab, 4 ref.

Descriptors: *Water quality control, *Land use, *Bacteria, Water pollution.
Identifiers: *Land treatment.

Before land management policies in municipal watersheds can be developed, the impact of various land uses on water quality must be known. Five indices which can be used to determine the impact of land use on water quality are discussed: suspended sediment, turbidity, and three 'pollution indicator' bacteria groups. Bacteria groups are better indicators of land use impact on water quality. The bacteria indicators showed that there was more pollution in the grazed and irrigated watershed than in the natural catchment. The study indicated that bacteria concentrations in a stream have a strong relationship to overland flow, stream discharge, and season of the year. Further studies are needed to explore these relationships. (Strachan-Chicago)
W71-10881

FOURTH DIMENSION FOR URBAN ENVIRONMENT,
Harza Engineering Co., Chicago, Ill.
Kenneth E. Sorensen.
Proceedings, American Society of Civil Engineers, Journal of the Urban Planning and Development Division, Vol 97, No UP1, p 91-104, April 1971, 10 fig.

Descriptors: *City planning, *Multiple purpose projects, *Tunnels, *Underground structures, Sewers, Flood control, Powerplants, Transportation, Civil defense, Urbanization.

Multipurpose uses of deep underground tunnels and chambers are proposed in urban areas for sewers, flood control, electric power plants, expressways, rapid transit and factories. The resulting urban complex would relieve surface congestion and provide more effective civil defense. (Davis-Chicago)
W71-10883

SOIL AS AN ANIMAL WASTE DISPOSAL MEDIUM,
Minnesota Univ., St. Paul. Dept. of Soil Science.
William P. Martin.
Journal of Soil and Water Conservation, Vol 25, No 2, p 42-45, March-April 1970, 18 ref.

Descriptors: *Waste disposal, *Soil contamination, *Soil conservation, *Environment, Food chains, Water pollution, Agriculture, Soil surveys, Soil properties, Management, Decision making, Natural resources, Soil types.

Identifiers: *Soil, *Animal waste, *Environment quality improvement, *Soil-water system, Soil system, Soil evaluation, Manure, Minnesota.

Through a discussion of manures and general soil properties, particularly in Minnesota, the author concludes that to accommodate growing volume of livestock wastes means must be devised of using the soil-water system as a disposal medium and in a way that minimizes pollution of this resource base. Agriculture faces the challenge of using soil, with its remarkable abilities for self-rejuvenation, as an animal waste disposal medium in a way that minimizes the pollution of this and related resources. Research is needed on the structure of soil. Soil surveys must be accelerated to provide information on soil type and interpretative evaluations researched for management decisions in the waste disposal area. It is necessary that we manage our natural resources to accommodate our waste disposal needs with a minimum of pollution and still be able to produce nutritious food for the population. (Strachan-Chicago)
W71-10885

THE CAUSES OF POLLUTION,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 05B.
W71-10889

ECONOMIC FACTORS IN WATER POLLUTION CONTROL: PART II,
Clemson Univ., S.C. Dept. of Economics.
Hugh Macaulay.
Business and Economic Review, Vol XV, No 8, p 2-7, May 1969.

Descriptors: *Water pollution control, *Economics, *Efficiencies, *Water pollution sources.
Identifiers: *Economic factor, Effluent charge.

The need exists for more efficient controls on water resources. The goal of these controls is analyzed, as well as the various means available for achieving this improved efficiency. Resources such as clean water and pure air have no obvious owner to oversee their efficient use and are frequently subject to externalities such that when one person uses one, its ability to serve others decreases. Everyone would like to have such articles in their highest quality but we cannot afford such luxuries. We should settle for less than best in such articles as water and air, as we do with most goods that we consume. From an economic standpoint the best way to achieve these ends is by an effluent charge. Subsidies and regulations seem to have little to recommend them towards effective water pollution control. (Strachan-Chicago)
W71-10890

WATER QUALITY AND RECREATIONAL LAND USE,
Maine Univ., Orono. Dept. of Civil Engineering.
Millard W. Hall, and Otis J. Sproul.
Public Works, Vol 102, No 3, p 52-56, March 1971, 5 fig, 3 tab, 22 ref.

Descriptors: *Water quality, *Land use, *Recreation, *Surface waters, Water pollution, Soil contamination, Septic tanks, Waste water treatment.
Identifiers: *Water contamination, Water recreation, Human enteric viruses, Soluble plant nutrients.

Forty-one percent of the population finds its recreation in outdoor water recreation. Picknicking, camping, and use of water tends to put organic and inorganic wastes, pathogenic organisms, toxic and odor-producing substances and trash in the environment of recreation areas. However, there has been barely any recognition of the problem of degradation of surface waters by water-borne pollutants coming from shore-side camps, cottages, and homes. Treatment of wastes at these locations is usually by means of a septic tank, and when the septic tanks are properly placed they are adequate for the job. However the misapplication of these septic tanks in waterfront areas can lead to hazardous health conditions. The author discusses the movement of human enteric viruses and soluble plant nutrients through the soil. It is suggested that these contaminants move greater distances through the soil than organic materials and bacteria. (Strachan-Chicago)
W71-10893

WATER AND WASTEWATER MANAGEMENT IN NEW YORK CITY,
Department of Water Resources, New York.
Maurice M. Feldman.
Public Works, Vol 102, No 3, p 58-59, March 1971, 2 photo, 1 tab.

Descriptors: *Wastewater disposal, Water pollution control, *Institutional constraints, New York.
Identifiers: *Environmental Protection Administration, New York City, Wastewater management, Solid waste management.

The organization and responsibilites of the Environmental Protection Administration (EPA) formed in 1968 by the New York City Council are described. The EPA is responsible for the water supply and water pollution control of the entire city. The EPA is also responsible for air pollution control and solid waste management, while the development of new water supplies remains in the jurisdiction of the Board of Water Supply. The reorganization evidenced in the formation of the EPA presaged similar reorganizations on the part of many states and the Federal government. The formation of a single agency to handle water resources has brought to a single focus the management of water and wastewater functions. Consequently, application of a utility outlook to the entire problem of water management becomes more possible. (Strachan-Chicago)
W71-10894

A REGIONAL SEWERAGE PLAN FOR THE WILAMETTE VALLEY,
Barrett and Associates.
Frank H. Barrett, and George W. Svoboda.
Public Works, Vol 102, No 4, p 72-75, April 1971, 2 fig, 1 photo.

Descriptors: *Sewerage, *Local governments, *Planning, Water pollution control, Oregon, Regions.
Identifiers: *Sewerage master plan, *Regional planning, Eugene-Springfield (Oregon), Lane Council of Governments.

Since water pollution transcends city boundaries and as more people move into suburban areas, the need for regional coordination of water pollution control programs increases. This article discusses the steps taken to produce a sewerage master plan for the Eugene-Springfield urbanizing area in Oregon. The project was sponsored by the Lane Council of Governments whose principal objective is to foster cooperation between local governments and to provide direction in development to its members. The plan is important because it represents successful and effective coordination between local governments and local interests and recognition of the need for long-term planning. (Strachan-Chicago)
W71-10895

A COMPARATIVE STUDY OF STATE WATER POLLUTION CONTROL LAWS AND PROGRAMS,
North Carolina Univ., Raleigh. Water Resources Research Inst.
Milton S. Heath.
Report No 42, May 1971, 246 p, 1 fig, 2 tab, 3 append. OWRR Project A-004-NC (3).

Descriptors: *Water quality control, *Water pollution control, *Pollution abatement, *State governments, Water quality, Water pollution control, Legislation, Federal government, Administrative agencies, Regulation, Administration, Water resources development, Water policy, Institutional constraints, North Carolina, Michigan, Maine, New York, Pennsylvania, Virginia, Legal aspects, Analytical techniques, Model studies, Standards.

Administrative, legal, and organizational aspects of water quality management are examined in selected states. The evolution of water pollution control problems is detailed, and a review is made of state organization and laws as a whole. The water pollution control programs for each selected state are discussed, and their strengths and weaknesses are noted. Recent developments demonstrate the rapid rate of change in the area of pollution abatement administration. The federal government has evolved into the major source of pollution control and abatement regulation. Important regulatory and organizational changes include grant-in-aid authorizations, stringent new oil pollution controls, and major pollution control legislation. A checklist for use by pollution control administrators offers a form of self-evaluation for state pollution control programs. The checklist points out some of the best features of state water quality management programs, as reflected in the actual experience of the study states. Various questions are set forth on the organization, scope of authority, administration, and enforcement of the state agencies concerned with water pollution. Several appendixes include a summary of literature on water pollution laws and programs, and an illustration of the use of citizen suits against pollution. (Smiljanich-Florida)
W71-10901

JUDICIAL PROTECTION OF WATER RESOURCES: PRIVATE ACTION, THE PUBLIC TRUST DOCTRINE AND ADMINISTRATIVE REVIEW,
Duncan E. Osborne.
Texas Law Review, Vol 48, No 6, p 1169-1182, 1970, 14 p, 85 ref.

Descriptors: *Texas, *Water pollution control, *Pollution abatement, *Adjudication procedure, Public rights, Water resources, Water law, Legal aspects, Water pollution, Water quality, Water quality control, Public health, Regulation, Administration, Administrative agencies, Administrative decisions, Water rights, State jurisdiction, Federal jurisdiction, Legislation, Judicial decisions, Non-structural alternatives.

The requirements and problems accompanying water pollution suits based upon negligence, nuisance, and the public trust doctrine are examined. Although considering other jurisdictions, the focus is primarily on Texas law. Effective administrative action is seen as the best solution to water pollution. Absent administrative action, however, and private suits will be brought with increasing frequency. Plaintiffs must be able to protect not only property rights but other intangible interests in public water. The trust doctrine or an expanded negligence or nuisance concept could provide such protection. Conservationists should seek legislation authorizing a citizen to bring suit against any public or private polluter. Under such an approach, a state agency would generally be responsible for protecting state waters from pollution, but a citizen could independently bring suit if the agency neglects its duty. The author also examines how the public's interest in effective pollution control may be advanced through judicial review of both state and federal agency decisions. (Robinson-Florida)
W71-10902

WATER POLLUTION IN IDAHO,
Merlyn W. Clark.
Idaho Law Review, Vol 1, p 111-137, 1964, 27 p, 135 ref.

Descriptors: *Idaho, *Water pollution, *Legal aspects, *Pollution abatement, Impaired water quality, Public health, Reasonable use, Wastes, Water, Water pollution treatment, Water quality, Water pollution control, Abatement, Regulation, Public rights, Water law, Interstate compacts, Water policy, Administrative agencies, Remedies, Damages.

Methods of water pollution control in Idaho are considered, with emphasis placed on legal solutions. Legal action available to individuals is discussed. Upon discovery that pollution of water has interfered with one's legal rights, the injured party may rely on actions in tort such as trespass, negligence, strict liability, and nuisance for recovery of damages. Public and private nuisance actions are discussed, along with actions which may afford injunctive relief. It is concluded that action by the individual is quite ineffective. State action in pollution control is considered, with emphasis upon nuisance statutes, various penal provisions, and the State Board of Health, which promises to be the first and only effective means by which the state can control water pollution. The Board has the primary function of controlling pollution caused by sewage or sewage effluents and any other pollution which may affect the public health. This function is accomplished through enforcement of state law and promulgation and enforcement of its own regulations. The Board also advises other agencies in water pollution matters. Finally, the Federal Water Pollution Act is considered in relation to the Idaho pollution problem. (Horwitz-Florida)
W71-10903

LIABILITY FOR POLLUTION OF SURFACE AND UNDERGROUND WATERS,
John D. Knodell, Jr.
Rocky Mountain Mineral Law Institute, Vol 12, p 33-99, 1967, 67 p, 273 ref.

Descriptors: *Water pollution control, *Judicial decisions, *Adjudication procedure, *Pollution abatement, Surface waters, Subsurface waters, Water quality control, Legislation, Administrative agencies, Regulation, Water pollution effects, Industrial wastes, Chemical wastes, Oil wastes, Saline water intrusion, Percolating water, Water law, Legal aspects, Risks, Riparian rights, Prior appropriation, Damages, Relative rights, Institutional constraints, Non-structural alternatives.

The development of liability for the pollution of surface and underground water is examined in this article. The theories of liability discussed include: (1) the doctrine of absolute liability, (2) negligence, (3) absolute liability or negligence per se imposed by statute or regulatory rule, (4) nuisance, and (5) the riparian or appropriative right to unimpaired water quality. Liability for the pollution of subterranean water is less clear than that for surface water because, under the common law, the right to consume underground water gives the right to pollute. Moreover, the pollution of underground streams has been artificially distinguished from pollution by percolation. To impose liability on multiple polluters not acting in concert, some states statutorily impose joint liability upon each polluter. Defenses utilized by polluters include: (1) lack of causation, (2) plaintiff's status as a trespasser, and (3) a contractual right to pollute. The author also considers: (1) statutes of limitations, (2) contributory fault, (3) the relief to which a plaintiff is entitled, and (4) future trends in pollution law as evidenced by federal and state statutes and trends in court decisions. (Rees-Florida)
W71-10904

WATER POLLUTION CONTROL REGULATIONS.
Nevada Division Of Health, Carson City. Bureau of Environmental Health.

1967, 61 p, 46 tab, append.

Descriptors: *Nevada, *Administrative agencies, *Water pollution control, *Water quality control, Legislation, Legal aspects, Administration, Administrative decisions, Regulation, Water pollution, Water quality, Pollution abatement, Public health, Environmental sanitation, Permits, State governments, Waste disposal, Waste water disposal, Adoption of practices, Supervisory control (Power), State governments, Interstate compacts.

The Department of Health and Welfare is designated as the state water pollution agency, and its powers and duties are herein specified. Anyone who causes or allows deleterious substances to be placed in the waters of this state is guilty of a misdemeanor. The attorney general with the consent of the governor shall maintain actions to prevent or restrain pollution of public waters. Anyone furnishing impure water for public or private use shall be guilty of a gross misdemeanor. Every health officer shall have the authority to order the abatement or removal of any nuisance. Punishments are herein provided for both health officers failing to enforce provisions herein set forth and persons violating such provisions. Regulations adopted by the Nevada Board of Health are herein set forth and deal with: (1) permits for the construction of waste disposal, treatment, or similar facilities; (2) restrictions on individual disposal systems; and (3) procedures for the adoption of water quality standards. Water quality standards are herein listed for specified bodies of water. Guidelines for formulating water quality standards for certain interstate waters are also provided. (Robinson-Florida)
W71-10905

WATER QUALITY CONTROL AT LAKE TAHOE: DISSERTATION ON GRASSHOPPER SOUP,
John Ayer.
California Law Review, Vol 58, No 6, p 1273-1331, 1970 59 p, 352 ref.

Descriptors: *Water quality control, *Eutrophication, *Nevada, *California, Water pollution, Water pollution effects, Water pollution sources, Water pollution control, Water quality, Standards, Waste disposal, Sewage disposal, Administrative agencies, Local governments, State governments, Federal government, Lakes, Water Quality Act, Non-structural alternatives, Oligotrophy.

Tahoe is an oligotrophic lake; its attraction as a resort, however, endangers the water quality of the lake. Agencies of both Nevada and California are involved in preventing eutrophication. The federal government is also involved to a limited extent. Inadequate sewage disposal has proven to be the most serious threat to Lake Tahoe. Attempts to create a combined local, state, and federal sewage disposal effort have been unsuccessful, although all agreed that treated sewage must somehow be exported from the Lake Tahoe area. As a result, parallel sewage export lines exist. The major difficulty with sewage export has been financing; ad valorem taxation has provided insufficient revenue to meet the needs. Sedimentation also endangers the water quality of Lake Tahoe. The sedimentation problem may, however, be alleviated through a soil conservation program. Other threats to the water quality of the lake are shore-line construction, disposal of solid wastes, and excessive enrichment from use of fertilizer in the surrounding area. Various frustrated attempts to export water from Lake Tahoe have also threatened water quality. One plan advocates limiting the population and commercial growth of the Tahoe area to prevent eutrophication. All plans agree, however, that some sort of regional approach is necessary to return Lake Tahoe's oligotrophic state. (Hart-Florida)
W71-10906

THE REFUSE ACT OF 1899: ITS SCOPE AND ROLE IN CONTROL OF WATER POLLUTION,
Diana D. Eames.
California Law Review, Vol 58, No 6, p 1444-1473, 1970, 30 p, 200 ref.

Descriptors: *Rivers and Harbors Act, *Water Quality Act, *Standards, *Water quality control, Navigation, Federal government, State governments, Administrative agencies, Permits, Wastes, Waste disposal, Water quality, Water pollution, Water pollution control, Legislation, Regulation, Legal aspects.
Identifiers: *Refuse Act.

In an attempt to combat water pollution, the federal government has recently filed several complaints for violation of the Refuse Act of 1899. The Refuse Act was enacted under the Congressional power to regulate navigation. Its purpose is generally construed to be the prevention of navigational obstructions. 'Refuse' has been interpreted to mean all foreign substances except liquid wastes. Permits for refuse discharges may be issued by the Corps of Engineers. Regulations recently issued by the Corps emphasize considerations not purely navigational. Criminal penalties exist for violation of the Act; furthermore, private citizens may have a remedy in a qui tam action under the 'bounty hunter' provision. Although the Refuse Act does not afford water quality standards, such standards are available under the Water Quality Act. State water quality standards may be accepted, but, where the state fails to establish acceptable standards, the federal government may establish them for the state's interstate waters. The standards are enforced through conference, hearings, and judicial review. The relationship between the two Acts is unclear, although the Refuse Act is not superseded by the Water Quality Act. Nevertheless, the criteria for issuing permits under the Refuse Act may be the standards established pursuant to the Water Quality Act. (Hart-Florida)
W71-10907

A REGULATION RELATING TO WATER QUALITY STANDARDS FOR INTRASTATE WATERS OF THE STATE OF WASHINGTON AND A PLAN FOR IMPLEMENTATION AND ENFORCEMENT OF SUCH STANDARDS.
Washington Water Pollution Control Commission, Olympia.

1970, 27 p.

Descriptors: *Washington, *Administrative agencies, *Water pollution control, *Standards, Regulation, Permits, Abatement, Inspection, Legal aspects, Waste treatment, Waste water (Pollution), Water pollution, Water pollution treatment, Water quality control, Water, Watercourses, Supervisory power (Control), Pollution abatement, State governments, Water temperature.

The Washington Water Pollution Control Commission herein promulgates regulations relating to water quality standards for intrastate waters and a plan for implementation and enforcement of such standards. A classification system is developed which is composed of the following five classes: (1) Lake Class, (2) Class AA extraordinary, (3) Class A excellent, (4) Class B good, and (5) Class C fair. The general characteristics and uses of each classification are enumerated, along with the specific water quality criteria applicable to each class. The criteria for each classification include specific regulations concerning: (1) total coliform organisms; (2) dissolved oxygen; (3) temperature; (4) pH; (5) turbidity; (6) toxic, radioactive or deleterious material concentrations; and (7) aesthetic values. The waters of the state are then classified generally or individually via classifications specifying 157 watercourses by name. Methods are enumerated for controlling domestic discharges, commercial and industrial operations, and miscellaneous waste discharges. Enforcement procedures are

effectuated through a surveillance program and the use of all potential means of control, including regulatory commission orders, civil penalties and criminal penalties. (Horwitz-Florida)
W71-10908

RULES OF THE TEXAS WATER QUALITY BOARD.
Texas Water Quality Board, Austin.

1970, 143 p.

Descriptors: *Texas, *Administrative agencies, *Water pollution control, *Water quality control, Water quality, Regulation, Water pollution, Pollution abatement, Waste disposal, Waste treatment, Waste water (Pollution), Standards, Septic tanks, Sewage treatment, State governments, Federal government, Administration, Adjudication procedure, Administrative decisions, Grants, Legislation, Legal aspects, Supervisory control (Power), Adoption of practices, Non-structural alternatives, Permits.

To simplify procedures, avoid delays, save expenses, and facilitate the administration of various water quality acts, rules of the Texas Water Quality Board are herein adopted. The Board is charged with furthering the conservation of natural resources and protecting environmental quality through water quality control. Methods and procedures relating to the sampling and measuring of water quality and certain defined wastes are set forth. The Board shall coordinate its actions with the appropriate state and federal agencies pursuant to various statutory guidelines. In considering proposed or existing waste disposal activities, and to encourage the development and use of regional waste collection, treatment, and disposal systems; the Board shall require applications for waste control orders and registration. No person may dispose of waste into water, unless authorized by and in compliance with a waste control order. If regulations of the Board are not complied with, waste control orders and registrations may be revoked or suspended. Procedures for public hearings, appeals, and enforcement of Board rules are herein specified. The Board shall set water quality standards for the state. Authority is also provided for planning grants, loans, and contracts. (Smiljanich-Florida)
W71-10909

MONTANA WATER QUALITY CRITERIA, WATER USE CLASSIFICATIONS, AND POLICY STATEMENTS.
Montana Dept. of Health, Helena. Div. of Environmental Sanitation.

1967. 17 p, 1 map, 1 tab.

Descriptors: *Montana, *Water quality control, *Water utilization, *Standards, Water pollution sources, Columbia River Basin, Legislation, Legal aspects, Radioactivity, Turbidity, Temperature, Dissolved oxygen, Hydrogen ion concentration, Pesticide residues, Sediments, Administrative agencies, Sewage treatment, Regulation, Adoption of practices, Administrative decisions.

The Water Pollution Control Council has adopted water quality criteria to be applied in relationship to water use classifications. Water quality criteria contain the following divisions: (1) organisms of the coliform group; (2) dissolved oxygen; (3) pH; (4) turbidity; (5) temperature; (6) residues; (7) sediments; (8) toxic or other deleterious substances, pesticides, and organic and inorganic materials; (9) radioactivity; and (10) aesthetic considerations. The quality of waters classified for multiple use shall be governed by the most stringent criteria listed for any use. The criteria are applicable only after a reasonable opportunity for discharges to mix with receiving waters, as determined by the Council, has occurred. It is the intent of the criteria that the increase allowed above natural conditions is the total allowable from all waste sources along the classified stream. Although the criteria specify minimum dissolved oxygen concentrations, it is the Council's policy to require the best practical treatment of oxygen-consuming wastes in order to maintain dissolved oxygen at the highest level above the specified minimum. Additional policy pronouncements are made. Water use classifications are herein assigned to the Columbia and Missouri Basins and the Hudson Bay drainage area. (Shelnut-Florida)
W71-10910

WASTE DISCHARGE REQUIREMENTS.
California Water Resources Control Board, Sacramento.

Administrative Procedures Manual, p 17-22, C1-17 (Rev 1971). 23 p, 2 fig, 1 tab, append.

Descriptors: *California, *Regulation, *Water pollution control, *Waste treatment, Administrative agencies, Supervisory control (Power), Standards, Inspection, Pollution abatement, State governments, State jurisdiction, Legal aspects, Planning, Sewage disposal, Sewage treatment, Water quality control, Water pollution treatment, Waste disposal, Waste water disposal, Waste water treatment, Adoption of practices.

Any person who is discharging or proposes to discharge waste, other than into a community sewer system, must file a report of waste discharge with the appropriate regional board. The required contents of such a report are set forth in this manual. Staff procedures for the coordination with other agencies of both routine and unique or critical discharge requirements are set forth. Procedures for staff preparation and presentation of the regional board's agenda in relation to the adoption of proposed waste discharge requirements are also enumerated. The format and content of waste discharge requirements are established along with a monitoring program to oversee waste discharges. Time schedules should be included in requirements for existing discharges when it appears that the discharger cannot immediately meet such requirements. A technical report is also required when any parameter in the requirements is threatened with violation by additional loadings. Each regional board is instructed to develop a schedule for the inspection of all waste dischargers within its region to determine compliance with waste discharge requirements. Included in the appendix are various forms and fee schedules relating to the manual's requirements. (Horwitz-Florida)
W71-10911

POLICY ON WATER POLLUTION CONTROL LAW ENFORCEMENT BY THE PARKS AND WILDLIFE DEPARTMENT.
Texas Parks and Wildlife Department, Austin.

1970. 5 p.

Descriptors: *Texas, *Regulation, *Water pollution control, *Administration, Supervisory control (Power), State governments, State jurisdiction, Pollution abatement, Water pollution sources, Water policy, Water pollution, Legal aspects, Inspection, Permits, Sewage, Wastes, Pollutants, Water pollution sources, Water quality control, Administrative agencies, Waste disposal.

The policy of the Parks and Wildlife Department shall be to conduct all water pollution control activities in cooperation with the Texas Water Quality Board. The Department's law enforcement personnel are authorized to enforce the provisions of Article 698 of the Texas Penal Code, when there is a violation by a person discharging waste not in compliance with a permit or other order issued by the Water Quality Board, Water Development Board, or Railroad Commission. Departmental personnel are empowered to enforce the provisions of this Article, and for such purposes they shall have the powers and duties of peace officers. A complaint should not be filed against the holder of a valid waste discharge permit issued by the Board unless the Board requests a complaint. If a waste discharge in compliance with the terms of a permit is adversely affecting aquatic life, wildlife, or recreation, it should be reported to the Board with a request that the permit be reviewed. General prosecution guidelines for littering and the dumping of small amounts of garbage, human waste, oil slicks, and fish carcasses are also set forth. (Horwitz-Florida)
W71-10915

THE RAILROAD COMMISSION LOOKS AT POLLUTION,
Jim C. Langdon.
South Texas Law Journal, Vol 8, p 179-187 (1966). 8 p, 10 ref.

Descriptors: *Texas, *Water pollution control, *Administrative agencies, *Oil industry, Oil wells, Pollution abatement, Water pollution, Impaired water quality, Standards, Wastes, Water conservation, Water quality act, Regulation, Saline water, Water pollution sources, Saline water intrusion, Groundwater, Well regulations, Oil fields, Oil wastes, Secondary recovery (Oil), Federal government, Legislation.

Pollution abatement is examined in this article in relation to the oil and gas industry of Texas. State regulation of the industry is traced from its beginnings in 1899. Emphasis is placed upon the Texas Railroad Commission's role in pollution control. The federal role in this area is likewise discussed with emphasis upon the Federal Water Pollution Control Act and the Water Quality Act of 1965. Jurisdictional difficulties between the Railroad Commission and the Texas Water Pollution Control Board over oil and gas regulation are traced to their present status which finds complete control in the Commission. Policy guidelines for future Commission actions are set forth along with specific operational guidelines in such areas as: drilling and completion operations, plugging and abandonment operations, surface disposal of produced oil field waters, subsurface disposal of produced oil field wastes, and secondary recovery and pressure maintenance projects. Finally, various potential legal problems in the field of pollution abatement by the Commission are set out for consideration. (Horwitz-Florida)
W71-10916

THE TRIAL OF A WATER POLLUTION CASE (LIABILITY FOR POLLUTION OF SUBTERRANEAN WATERS),
Earl R. Allison, and Dwight R. Mann.
Baylor Law Review, Vol 13, p 199-224 (1961). 26 p, 76 ref.

Descriptors: *Adjudication procedure, *Subsurface waters, *Water pollution control, *Oil industry, Texas, Legal aspects, Judicial decisions, Saline water intrusion, Water law, Water rights, Competing uses, Civil law, Legislation, Water pollution, Pollution abatement, Wells, Oil wells, Drilling, Groundwater, Leases, Regulation.

Problems and duties relating to the pollution of subterranean water by an oil operator are examined in this article with particular regard to the practical, as well as the legal, aspects of the problem. Texas cases developing the doctrines which impose legal liability upon oil producers for such pollution are put forth and deal with both adjacent landowners and lessee-lessor suits. The effect of Rule 20 of the Texas Railroad Commission in liability of oil producers for subterranean water pollution is also considered. The two principal defenses available in such actions, limitations and incurred risk, are analyzed and considered in relation to not only Texas cases but those of other states as well. The various practical steps to be followed in order to determine if the injured party has a cause of action are also examined. (Horwitz-Florida)

W71-10917

KENTUCKY LAW ON WATER,
Kentucky Legislative Research Comm, Frankfort.
James C. Clay.
Research Report No 25, (1965). 19 p, 13 ref.

Descriptors: *Kentucky, *Water resources development, *Administrative agencies, *Water pollution control, Legislation, Water quality control, Water supply, Water conservation, Administration, Water management (Applied), Water policy, Pollution abatement, Water pollution treatment, Groundwater, Streams, Lakes, Water districts, Permits, Legal aspects, Judicial decisions, Regulation.

State law relating to water resources development is summarized, including statutes and important cases adjudicating water rights. Regulations governing water quality are set forth. The Water Pollution Control Commission is the agency charged with requiring a degree of waste treatment which will protect streams for use by downstream water users, and with regulating discharges into streams. The state water resources administrative structure is detailed. At the interstate level, various water pollution control groups are described, including certain interstate water pollution control commissions and the Interstate Water Sanitation Board. State departments, agencies, boards and commissions are listed with a description of their duties and functions. The Department of Health has major responsibility in water pollution control. Various special purpose districts, such as sanitation districts, are described. The ultimate responsibility for water management functions is found at the state agency level. Financing for the various water management projects is furnished at the local level by the governmental unit involved. Present programs and research projects relating to water pollution and waste treatment are described. Possible solutions to water management problems are suggested, such as increased use of municipal waste treatment facilities. (Smiljanich-Florida)
W71-10918

INDUSTRIAL WASTES.
Pennsylvania Sanitary Water Board, Harrisburg.
For primary bibliographic entry see Field 06E.
W71-10919

INTERNATIONAL ADMINISTRATIVE DUE PROCESS AND CONTROL OF POLLUTION--THE CANADIAN ARCTIC WATERS EXAMPLE,
Daniel Wilkes.
Journal of Maritime Law and Commerce, Vol 2, No 3, p 499-539, 1971. 41 p, 136 ref, append.

Descriptors: *Canada, *Water pollution control, *Arctic Ocean, *Regulation, Water zoning, Standards, Control, Pollution abatement, Water pollution effects, Water pollution, Water policy, Legal aspects, Water law, Law of the sea, Inspection, Oil wastes, Water pollution sources, Icebergs, Sea water.

An analysis of Canada's Water Act and Arctic Waters Pollution Prevention Act is undertaken. The Arctic Water Act establishes almost all useful waters and lands above the 60th parallel as an area in which all waste is regulated. This article focuses on the extent to which the specific methods for controlling pollution used in the Canadian law compare to minimal standards of international administrative due process. First, the Canadian law is analyzed in an attempt to discover inconsistencies in it with respect to international standards of pollution control. The adequacy of the controls is examined with respect to their scope. Since the law extends pollution control jurisdiction 100 miles into the Arctic waters of Canada, both Canadians and other nationals are governed by the law. Pollution is given a very broad definition in the law, thereby covering almost all sources of contamination. The article goes on to list and test the fairness of the penalties provided for pollution offenses. Finally, the need for the Canadian law is considered, along with the need for common international standards. (Horwitz-Florida)
W71-10920

SOLID WASTE DISPOSAL.
For primary bibliographic entry see Field 06E.
W71-10921

THE REFUSE ACT: ITS ROLE WITHIN THE SCHEME OF FEDERAL WATER QUALITY LEGISLATION.
New York University Law Review, Vol 46, No 2, p 304-352 (1971). 49 p, 316 ref.

Descriptors: *Rivers and Harbors Act, *Water Quality Act, *Water pollution control, *Administrative agencies, Permits, Legislation, Administrative decisions, Legal aspects, Water pollution, Water pollution sources, Water quality, Water quality control, Standards, Regulation, Judicial decisions.
Identifiers: *Refuse Act.

In response to the clamor for environmental pollution control, prosecutions have begun under the Refuse Act of 1899. Creating an obstruction to navigation is not a necessary element to violation of the Act; therefore it may be used for pollution control. The Act reaches all navigable waters and their tributaries. The term 'refuse' is comprehensive. Any discharge of refuse can result in fine or imprisonment. The Federal Water Pollution Control Act complements the Refuse Act; pollution abatement under the Refuse Act is much more efficient and effective. Consequently, attempts have been made to integrate the Refuse Act into the Federal Water Pollution Control Act. When the Secretary of the Army requests prosecution under the Refuse Act, the United States attorney is obligated to prosecute. Furthermore, permits for discharges may be issued under the Refuse Act, but assessment of the environmental impact of the decision is not required. Few permits have been issued. Recent orders, however, condition permits upon compliance with the Water Pollution Control Act. Regulations by the Corps of Engineers, Environmental Protection Agency, and Justice Department incorporate the Refuse Act into scheme of the water pollution control legislation. Citizens may also be able to enforce the Refuse Act through qui tam actions, or by challenging permit issuance. (Hart-Florida)
W71-10922

AREAS SURROUNDING CERTAIN WATER IMPOUNDMENTS.
For primary bibliographic entry see Field 06E.
W71-10923

ENVIRONMENTAL ISSUES IN REACTOR LICENSING,
George F. Trowbridge.
Atomic Energy Law Journal, Vol 12, p 251-262, 1970. 12 p.

Descriptors: *Water quality control, *Radioactive waste disposal, *Permits, *Thermal pollution, Regulation, Administrative agencies, Legal aspects, Legislation, Federal government, Standards, Water policy, Environmental effects, Radioactive wastes, Nuclear wastes, Water pollution sources, Nuclear reactors, Water pollution control.
Identifiers: *Water Quality Improvement Act, *National Environmental Policy Act.

Under the Atomic Energy Act of 1954, the Atomic Energy Commission was given the responsibility for regulating discharges of radioactive materials from nuclear reactors into surrounding waters. However, the Commission has construed the Act as giving it no authority to consider other environmental effects, such as thermal pollution, in licensing nuclear reactors. The passage of the National Environmental Policy Act and the Water Quality Improvement Act have created a number of legal problems in the area of licensing reactors. The former requires the Commission to prepare a detailed environmental impact statement on the issuance of a reactor license. It is unclear, however, what action is to be taken by the Commission after the statement has been prepared. The Commission has construed the Act not to authorize it to consider environmental effects other than those involved with radioactive materials. The Water Quality Improvement Act requires certified compliance with applicable water quality standards prior to the issuance of any federal license. The Commission feels that water quality aspects of reactor construction and operation are covered by this certification and that such aspects need not be embodied in a license condition or the impact statement. (Johnson-Florida)
W71-10924

NATIONAL ENVIRONMENTAL PROTECTION POLICY,
David E. Wells.
Florida Bar Journal, Vol 45, No 3, p 116-121 (1971). 6 p, 19 ref.

Descriptors: *Environmental effects, *Highway relocation, *Highway beautification, *Legislation, Federal government, State governments, Administrative agencies, Judicial decisions, Legal aspects, Ecology, Environmental engineering, Water pollution control, Scenic highways, Government finance.
Identifiers: *National Environmental Policy Act, *Water Quality Improvement Act.

This article reports on the Federal Highway Administration's attempts to locate highways so as to affect least adversely the surrounding environment. The Department of Transportation plans highway locations with consideration of the requirements of recent federal legislation: (1) the National Environmental Policy Act of 1969, (2) the Water Quality Improvement Act of 1970, and (3) the Environmental Quality Improvement Act of 1970. Highway location considerations include conservation, scenic enhancement, historic preservation, and the control of air and water pollution. Public hearings allow public participation in determining whether such location accords with 23 listed social, economic, and environmental factors. The article examines agencies established within the Department of Transportation to guide in planning and designing highways compatible with the total environment. Also court decisions are analyzed which interpret the Department's efforts to accomplish its stated objectives of highway beautification. (Rees-Florida)
W71-10926

POLLUTION CONTROL FACILITIES EXEMPT FROM TAXATION.
For primary bibliographic entry see Field 06E
W71-10927

STATUTORY TREATMENT OF INDUSTRIAL STREAM POLLUTION,
W. B. Smith.
George Washington Law Review, Vol 24, No 3, p 302-319, 1956. 18 p, 100 ref

Descriptors: *Water pollution control, *Industrial wastes, *Pollution abatement, *Streams, Water pollution, Legal aspects, Legislation, Riparian rights, Remedies, Waste water treatment, Waste treatment, Waste water (Pollution), Interstate compacts, Federal government, State governments, Water resources development, Regulation.

A general look at the industrial waste treatment situation shows that there are known methods of reducing and treating most wastes, but that few industries are effectively treating wastes because of

the cost factor. The remedies of a riparian landowner damaged by stream pollution are governed by established principles of real property and tort law. The author discusses various legal and social aspects of the common law remedies of private and public nuisance, trespass, and equitable injunctive relief under the balance of convenience doctrine, concluding that they have been inadequate to prevent stream pollution. This inadequacy and the increased awareness of the pollution problem has prompted state regulations. The general nature of both the early and more modern water pollution control statutes is explored, as well as the constitutionality of state regulation. There is a substantial discussion of the effectiveness of interstate compacts, suits between states, early federal legislation, and the Water Pollution Control Act in abating interstate pollution. As a practical solution to the problems of industrial pollution, the author contends that broad, comprehensive legislation by the states is needed. (Gallagher-Florida)
W71-10928

REGULATING DISPOSAL OF SEWAGE AND LITTER.
For primary bibliographic entry see Field 06E.
W71-10929

THE USE OF THE FEDERAL INCOME TAX SYSTEM TO COMBAT AIR AND WATER POLLUTION: A CASE STUDY IN TAX EXPENDITURES,
Paul R. McDaniel, and Alan S. Kaplinsky.
Boston College Industrial and Commercial Law Review, Vol 12, No 3, p 351-386, 1971. 36 p, 103 ref, 1 append.

Descriptors: *Pollution abatement, *Government supports, *Taxes, *Financial analysis, Water pollution, Government finance, Quality control, Political aspects, Federal government, Economics, Financing, Legal aspects, Water policy, Regulation, Air pollution, Water pollution control, Amortization.

This article examines the considerations involved in using the federal income tax system to encourage efforts to control environmental pollution through the five year rapid amortization provision of section 169 of the Internal Revenue Code. The legislative history of section 169 reveals that this provision was a substitute for the seven per cent investment credit. The provision is analyzed in relation to tax expenditures, tax equity, and in its relation to pollution abatement. Alternative methods of viewing the rapid amortization provision are examined in detail, and it is deemed to be a form of federal cost sharing. The tax privilege for pollution control facilities is described as an ill-advised response to the pollution problem. As a tax expenditure, it violates the integrity of the federal corporate income tax system. As a system of federal cost sharing, it is an inefficient and ineffective vehicle for providing federal financial assistance to abate air and water pollution. (Horwitz-Florida)
W71-10931

PUBLIC HEALTH REGULATIONS.
For primary bibliographic entry see Field 06E.
W71-10932

POLLUTION IN PERSPECTIVE: A SURVEY OF THE FEDERAL EFFORT AND THE CASE APPROACH,
Stanley W. Schroeder.
Natural Resources Lawyer, Vol 4, No 2, p 381-428, 1971, 48 p, 1 tab, 1 chart, 124 ref.

Descriptors: *Federal government, *Pollution abatement, *Water pollution control, *Water quality control, Water pollution, Air pollution, State governments, Legislation, Judicial decisions, Administrative agencies, Administration, Water Quality Act, Clean Air Act, Supervisory control (Power), Expenditures, Federal budgets, Remedies, Damages, Adjudication procedure, Legal aspects.

An overview of the nation's pollution control effort is provided through an examination of recent federal legislation, congressional financial authorization, and the role played by courts. A review of the historical development of the major federal air, water, and solid waste pollution control legislation points to the recent upsurge in federal concern for the environmental crisis. Summaries are provided of legislation such as the Water Pollution Control Act and the Water Quality Improvement Act. Past congressional authorizations and appropriations are reviewed in order to better quantify the federal effort and determine where money was spent and what Congress has attempted to accomplish. Case law is examined in identifying some of the principal issues confronted by the courts, including a discussion of traditional common law remedies, court jurisdiction, judicial review of agency action, and various defenses available to polluters. The determination to provide federal leadership over the pollution control effort is amply evidenced by the activity of institutions that have been newly created. Pervasive issues still pending are discussed, including the needs of workers in a polluting facility, and the role of public interest law firms. (Smiljanich-Florida)
W71-10933

AMORTIZATION OF ADJUSTED BASIS OF DEVICE TO CONTROL WATER POLLUTION OR TO REMOVE ATMOSPHERIC POLLUTANTS.
For primary bibliographic entry see Field 06E.
W71-10934

AN INTRODUCTION TO ENVIRONMENTAL LAW,
George D. Bruch.
Villanova Law Review, Vol 16, No 5, p 815-826, 1971, 12 p, 66 ref.

Descriptors: *Legislation, *Administrative agencies, *Water pollution control, *Air pollution, Rivers and Harbors Act, Water Quality Act, Federal government, Permits, Legal aspects, Judicial decisions, Administration, Standards, Regulation.

A series of articles concerning Pennsylvania's environmental pollution control law is introduced by summary of recent developments in environmental pollution control at the federal level. The National Environmental Policy Act creates the Council on Environmental Policy, responsible for formulation of national environmental policy and review of governmental operations affecting the environment. Furthermore, the Environmental Protection Agency was recently created to formulate specific environmental protection standards and to conduct environmental research. Legislation assisting the new agencies includes the Clean Air Act, the Air Quality Act, and the Water Quality Improvement Act; one of the most important statutes to prevent water pollution, however, is the Refuse Act of 1899. A new program has commenced under the provisions of the Refuse Act to control water pollution by prosecution for waste disposal without the permit required by the Act. Moreover, recent decisions have greatly broadened the concept of standing, thus enabling citizens to initiate private litigation to enjoin pollution. In addition, legislation permitting citizens to recover costs of such successful litigation has been proposed. (Hart-Florida)
W71-10935

ENVIRONMENTAL CONSERVATION LAW.
For primary bibliographic entry see Field 06E.
W71-10936

SALE OR DISPOSAL OF SALT WATER FOR POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-10939

REGULATIONS GOVERNING WATER CLASSIFICATION AND CONTROL OF QUALITY.
Vermont Water Resources Board, Montpelier. Agency of Environmental Conservation.

Vermont Water Resources Board, Regulations Governing Water Classification and Control of Quality, 1971, 18 p.

Descriptors: *Water pollution control, *Vermont, *Water quality, *Water quality control, Standards, Water pollution, Pollution abatement, Water pollution sources, Pollutants, Treatment facilities, Waste disposal, Waste dilution, Waste treatment, Public health, Recreation, Boating, Irrigation, Fish conservation, Bacteria, Thermal pollution, Eutrophication, Water supply, State governments, Legal aspects, Adoption of practices.

Pursuant to legislation, the Vermont Water Resources Board herein promulgates rules governing the classification of state waters for quality control purposes. All proposed new or increased sources of pollution will be required to provide the best practical degree of waste treatment. Giving due consideration to all factors pertinent to the public interest, state waters are classified on the basis of the quality of water to be obtained and maintained. Classes of water include: (1) public water supply; (2) recreation and irrigation; (3) boating and wildlife habitat; (4) power, navigation, and certain industrial processes; and (5) mixing zones for the dispersal and dilution of wastes. Chemical, bacteriological, and thermal requirements are specified for the various classes of water. Discharges are prohibited in waters used for public water supply. Waste discharges are restricted in other classes of water, and treatment requirements are delineated. Discharge of wastes containing nutrients which encourage eutrophication are prohibited. Water type specifications are listed, along with interstate waters, designated by water type. (Smiljanich-Florida)
W71-10940

MANUFACTURE AND USE OF CONTAMINANTS.
Indiana Stream Pollution Control Board, Indianapolis.

Regulations SPC 2 (1953), SPC 3 (1963).

Descriptors: *Indiana, *Acid mine water, *Chemical wastes, *Coal mine wastes, State governments, Administration, Administrative agencies, Administrative decisions, Regulation, Water pollution, Water pollution control, Water quality, Water quality control, Water policy, Pollution abatement, Mine drainage, Mine wastes, Poisons, Toxins.

Any person, firm or corporation engaged in the manufacture or other use of cyanides or cyanogen compounds shall construct all rooms where such compounds are kept so that none of said compounds can escape by any means into any sewer system or watercourse. Limited amounts of such substances determined by the Stream Pollution Control Board not to be detrimental to public health or any body of water shall not come under this provision. Everyperson, firm, corporation or other legal entity who owns any coal mine or is engaged in the handling of coal in Indiana shall dispose of refuse, including gob and coal fines, so as to create minimal acid mine drainage and deposits of coal fines in the waters of Indiana. No gob shall be used in road construction where it may cause acid mine drainage into the waters of Indiana. (Robinson-Florida)
W71-10941

REQUIREMENT FOR SUBMISSION OF MONTHLY OPERATION REPORTS BY INDUSTRIAL, COMMERCIAL, OR AGRICULTURAL TREATMENT FACILITIES.
Indiana Stream Pollution Control Board, Indianapolis.

Indiana Stream Pollution Control Board, Regulation SPC 11 (1971). 2 p.

Descriptors: *Indiana, *Water pollution control, *Water quality control, *Waste water (Pollution), Regulation, Water law, Legal aspects, State governments, Administration, Administrative agencies, Administrative decisions, Water pollution, Water quality, Pollution abatement, Effluents, Waste water disposal, Waste water treatment, Water policy, Water resources.

Every person, firm, or corporation that operates any type of waste treatment plant or discharges wastewaters into the waters of Indiana shall submit to the Stream Pollution Control Board monthly reports which shall include flow measurements and effluent characteristics. Wastewater is the liquid and water-carried wastes from an industrial, commercial, or confined animal feeding operation. The Technical Secretary of the Board shall prescribe the required frequency for sampling, measuring the flow, and determining the characteristics of the effluent. All analytical work shall be performed in accordance with the most recent edition of 'Standard Methods for the Examination of Water and Wastewater' published by the American Public Health Association. Any unusual changes in volume and characteristics of the effluent shall be reported immediately to the Technical Secretary. All reports shall be prepared by the certified wastewater treatment plant operator and submitted prior to the fifteenth day of the following month. (Robinson-Florida)
W71-10942

RULES, REGULATIONS, CLASSIFICATIONS AND WATER QUALITY STANDARDS APPLICABLE TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dep't of Water and Air Resources, Raleigh.

1970, 17 p.

Descriptors: *North Carolina, *Surface waters, *Water Quality Act, *Standards, Water resources development, Water conservation, Water quality control, Pollutants, Water pollution sources, Water pollution effects, Water pollution treatment, Water sources, Water supply, Water utilization, Water resources, Water users, Water purification, Public health, Watersheds (Basins), Watershed management, Legislation, Institutions, Administration.

North Carolina's public policy is declared to be the conservation and beneficial development of its air and water resources. The Board of Water and Air Resources has formulated rules and regulations by which to classify the state's surface waters for their most prudent utilization for the general welfare. The Board administers a comprehensive program of pollution abatement and water resources management. Surface waters are classified for certain uses with respect to quality: (1) A-1 waters are the best source of water for drinking and cooking; (2) class A-11 waters are also excellent sources of water supply for A-1 purposes when properly treated; (3) class B waters are restricted to bathing purposes; (4) class C waters are restricted to fishing, boating, and other non-swimming activities; and (5) class D waters are best used for agricultural, industrial and navigational purposes. Separate classifications for tidal salt waters are: (1) class SA for commercial shellfishing; (2) class SB for bathing; and (3) class SC for fishing, except commercial shell-fishing. (Rees-Florida)
W71-10944

WATER QUALITY STANDARDS.
Massachusetts Water Resources Commission, Boston. Div. of Water Pollution Control.

1967, 12 p.

Descriptors: *Massachusetts, *Water quality, *Standards, *Water pollution, Pollution abatement, Water pollution control, Water pollution sources, Pollutants, Sewage effluents, Sewage sludge, Public health, Recreation, Boating, Navigation, Fish conservation, Economic impact, Dissolved oxygen, Bacteria, Oil, Thermal pollution, Radioactivity, Irrigation, Commercial shellfish, Water supply, Legal aspects, Regulation.

To achieve the objective of the Massachusetts Clean Water Act and to assure maximum water use, standards are herein adopted and made applicable to all waters. In the classification of waters consideration has been given to such factors as public health, public enjoyment, fish and wildlife conservation, and economic and social development. Classifications are not intended to permit indiscriminate waste disposal or to allow minimum efforts of waste treatment under any circumstance. Water quality criteria for each water classification include maximum levels of dissolved oxygen, sludge deposits and floating solids, color and turbidity, bacteria, taste and odor, pH, temperature and radioactivity. The classes of water use are: (1) public water supply; (2) bathing and water contact recreation; (3) wildlife habitats and irrigation; (4) navigation, power and industrial cooling; (5) coastal shellfish and marine water contact recreation; (6) marine recreation and fish habitat; and (7) marine boating and industrial cooling. Waters shall be substantially free of pollutants unduly affecting bottom fauna, the physical or chemical nature of the bottom, or spawning of fish or their eggs. (Smiljanich-Florida)
W71-10945

POLICY ON WASTEWATER TREATMENT PLANT OUTFALLS.
Wisconsin Dept. of Natural Resources, Madison.

Wisconsin Dept. of Natural Resources, Madison, Wis. (1970). 1 p.

Descriptors: *Wisconsin, *Waste water disposal, *Right-of-way, *Treatment facilities, Outlet works, Sewage effluents, Waste water (Pollution), Pollution abatement, Water pollution sources, Ditches, Outlets, Administrative agencies, Planning, Legal aspects, Construction, Sewage disposal, Adoption of practices, Regulation.

Disposal of effluent from waste water treatment plants into surface waters with adequate assimilative capacity may at times be impractical except through the use of a ditch or other conveyance. It is the policy of the Natural Resources Board of the Department of Natural Resources that, in such cases, evidence of obtainment of rights-of-way for effluent discharge be included in waste water treatment project construction plans. Where such rights-of-way cannot be obtained, plan approval may be granted by the Department upon proof that notice has been given to the owners across whose lands the effluent will be discharged. (Smiljanich-Florida)
W71-10946

POLICY ON PHOSPHOROUS REMOVAL FROM EFFLUENT.
Wisconsin Dept. of Natural Resources, Madison.

1969, 1 p.

Descriptors: *Wisconsin, *Phosphorus, *Sewage effluents, *Water pollution sources, Water pollution, Water quality control, Pollution abatement, Waste water disposal, Waste water (Pollution), Eutrophication, Waste water treatment, Treatment facilities, Administrative agencies, Legal aspects, Industrial wastes, Municipal wastes, Lake Michigan, Regulation, Standards, Lake basins.

Concentrations of phosphorous may stimulate the growth of algae, making waters unsuitable for certain uses. Sewage effluents often contribute large amounts of phosphorus to surface waters. In order to enhance the quality of water, it is the policy of the Natural Resources Board of the Department of Natural Resources that waste water dischargers shall be required to provide for the removal of excess amounts of phosphorus. Necessary actions shall be taken to achieve an eighty percent reduction of the phosphorus tributary to municipal and industrial waste treatment facilities located within the Lake Michigan drainage basin by December 31, 1972. (Smiljanich-Florida)
W71-10947

WATER QUALITY ACTIVITIES.
In: Delaware River Basin Comm., Annual Report, p 6-12, 1969, 7 p, 1 map, 1 photo.

Descriptors: *Delaware River Basin Commission, *River basin development, *Water resources development, *Research and development, Interstate compacts, Legislation, Legal aspects, Interstate rivers, Projects, Reservoir operation, Fish conservation, Water pollution control, Water supply, Water quality control, Pollution abatement, Sewage disposal, Sewage treatment, River basisn, Financing.

Pursuant to the Delaware River Basin Compact the Delaware River Basin Commission is the governmental authority changed with responsibility for protecting, planning, developing, and managing the water resources of the basin. This report reviews and summarizes the Commission's activities and projects for the year concerning: (1) water quality within the basin, (2) the prevention and cleanup of pollution spills, (3) water-sewerage relationship studies, (4) progress on the regional waste disposal system, (5) river systems analysis and management, (6) development of watershed associations to initiate and coordinate local action, (7) the status of water reservoir capacity, (8) the condition of rivers, (9) fish conservation research, (10) present and projected water supplies, and (11) the financial status of the Commission. Specific coverage is given Tocks Island area protection and the development of the Salem-Gloucester regional waste disposal system. (Gallagher-Florida)
W71-10948

COUNTY BOARDS AUTHORIZED TO PREVENT AND ABATE WATER POLLUTION.
For primary bibliographic entry see Field 06E.
W71-10949

WATER QUALITY CRITERIA FOR INTERSTATE AND COASTAL WATERS.
Mississippi Air and Water Pollution Control Comm, Jackson.

Regulation 1-67A, 1968. 11 p.

Descriptors: *Mississippi, *Water Quality Act, *River basins, *Standards, Watershed management, Water quality, Water properties, Water requirements, Water sources, Water supply, Pollutants, Water pollution control, Water utilization, Water users, Public health, Administrative agencies, Administration, Regulation, Shellfish, Recreation, Fish conservation, Wildlife, Navigation, Water resources development, Streams.

The Mississippi Air and Water Pollution Control Commission is directed to prevent, eliminate, and reduce to acceptable levels the pollution of interstate and coastal waters. The program's objective is to protect the public health by guaranteeing enhanced water quality for all uses of state waters. Minimum quality standards applicable

to all waters are provided, specifying that waters shall be free from municipal, industrial, and agricultural wastes that produce sludge deposits; toxic substances harmful to human and aquatic life; and other deleterious discharges. Specific water quality criteria are provided for: (1) public water supplies, (2) shellfish harvesting areas, (3) recreation areas, (4) fish and wildlife, (5) agricultural and industrial water supplies, and (6) navigation and utility use. Standards include maximum amounts of: (1) dissolved oxygen; (2) pH; (3) temperature; (4) bacteria; (5) specific conductance; (6) dissolved solids; (7) toxic substances; and (8) color, taste and odor-producing substances. A list of stream classifications is provided. (Rees-Florida)
W71-10950

WATER CLASSIFICATION--STANDARDS SYSTEM FOR THE STATE OF SOUTH CAROLINA.
South Carolina Pollution Control Authority, Columbia.

1971. 14 p.

Descriptors: *South Carolina, *Standards, *Water quality control, *Water pollution control, Water Quality Act, Regulation, Water quality, Waste disposal, Water pollution, Pollution abatement, Legal aspects, Legislation, Fish conservation, Thermal pollution, Sewage treatment, Waste treatment, Public health, State jurisdiction, State governments, Non-structural alternatives, Specifications.

South Carolina's public policy requires the maintenance of reasonable water purity standards consistent with the public welfare, maximum employment, industrial development, and the protection of wildlife. Implementing this policy, the Pollution Control Authority herein adopts rules which: (1) set specific water quality standards for classifying all waterbodies, (2) prohibit the use of water solely for transporting wastes, (3) prohibit waste discharge without secondary treatment or its equivalent, (4) establish the priority of main stream standards over tributary standards, (5) establish procedures for determining quality standard compliance, (6) prohibit the discharge of certain wastes harmful to fish, (7) set general criteria for applying quality standards, (8) provide exceptions to quality standards where pollution levels result from natural causes, and (9) establish specific thermal pollution standards in certain streams and rivers. (Gallagher-Florida)
W71-10951

CONTROL, PREVENTION, AND ABATEMENT OF POLLUTION OF SURFACE WATERS.
For primary bibliographic entry see Field 06E.
W71-10952

WYOMING SPILLS CONTINGENCY PLAN.
Wyoming Dept. of Health and Social Services, Cheyenne. Div. of Health and Medical Services.

1971. 21 p, 3 append.

Descriptors: *Wyoming, *Pollution abatement, *Water pollution control, *Oily water, Water pollution, Oil, Water quality control, Water pollution sources, Water pollution treatment, Pollutants, Waste disposal, Path of pollutants, Barriers, Engineering structures, Oil wells, Oil industry, Oil reservoirs, Short-term planning, State governments, Administrative agencies, Regulation, Legal aspects, Supervisory control (Power), Adoption of practices.
Identifiers: *Oil spills.

To assure prompt and effective response to the problems created by accidental spills of oil and other hazardous substances, a Wyoming contingency plan is herein adopted. Its primary goal is to limit damage to property, wildlife, or the environment from oil spills. Immediately upon the observance of a spill which could possibly result in pollution, designated state officials shall be notified. Information concerning the spill, including the location of the spill, the amount and nature of the substance spilled, the distance to the nearest public water supply, and the status of containment, shall be given to the Environmental Protection Agency. An investigation team shall be dispatched to the site to determine the severity of the spill and the need for specific action such as: (1) source control procedures, (2) salvage operations, (3) boom or physical barrier placement, or (4) other appropriate methods having no adverse effects on the aquatic environment. After the pollutants are confined, action shall be started to remove the pollutant from the water and on shore areas. The discharger shall be legally responsible for all costs incurred by the state. (Smiljanich-Florida)
W71-10953

WATER POLLUTION CONTROL (ADMINISTRATIVE ORGANIZATION).
For primary bibliographic entry see Field 06E.
W71-10955

WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 06E.
W71-10956

WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-10957

NEBRASKA CLEAN WATERS COMMISSION ACT.
For primary bibliographic entry see Field 06E.
W71-10958

ARKANSAS WATER WELL CONSTRUCTION ACT.
For primary bibliographic entry see Field 06E.
W71-10959

RULES AND REGULATIONS FOR SUBSURFACE DISPOSAL SYSTEMS.
Colorado Dept. of Health, Denver. Water Pollution Control Commission.

1970. 9 p.

Descriptors: *Colorado, *Waste disposal, *Injection wells, *Regulation, Permits, Administrative agencies, Administrative decisions, Injection, Well permits, State governments, Adoption of practices, Construction, Standards.

Conditions for the location, construction, and operation of subsurface disposal systems are provided by these Colorado Department of Health regulations. Following a comprehensive list of definitions of applicable terms, the regulations provide that subsurface disposal systems will not be operated without a permit. Permits will be issued upon application and a finding, after notice and hearing, that no substantial adverse affect upon Colorado waters will occur from the proposed disposal. The Commission may require other pollution abatement and control measures as a condition subsequent to granting a permit. Permit applications must include a very comprehensive description of the project and the surrounding area, including descriptions of: (1) well engineering data; (2) geological and physical characteristics of the injection interval and the over- and under-lying impermeable barriers; (3) waste characteristics; (4) mineral resources present in the area; and (5) local topography, industry, agriculture and population. The preliminary review of applications is possible and administrative due process is afforded through the notice and hearing provisions. Notice and hearing are also required for the termination and abandonment of existing systems. Liability under statutory or common law, however, is not absolved by compliance with these regulations. (Hart-Florida)
W71-10960

GUIDELINES FOR CONTROL OF WATER POLLUTION FROM MINE DRAINAGE.
Colorado Dept. of Health, Water Pollution Control Comm, Denver.

1970. 10 p, 30 ref, 3 append.

Descriptors: *Colorado, *Water pollution control, *Mine drainage, *Mine wastes, Acid mine water, Chemical wastes, Mine acids, Mine water, Mining, Waste disposal, Mining engineering, Water pollution sources, Water pollution treatment, Water pollution effects, Pollutants, Pollution abatement, Administrative agencies, Regulation, Streams.

Regulations governing mine drainage are discussed in these guidelines for control of water pollution from mine drainage. Additionally, the effects of acid and mineral pollutants from mines are delineated. In order to control pollution from mine drainage: (1) surface waters and groundwaters should be diverted to prevent entry or reduce the flow of water into and through workings; (2) water entering the works should be handled so as to minimize the formation and discharge of pollution-causing drainage; (3) mining refuse should be handled so as to minimize pollutional drainage, and selective placement of waste materials to avoid percolation of surface waters through them should be practiced; (4) polluted drainage from mining operations should receive remedial treatment necessary to maintain the level of quality required by classification of receiving waters; (5) discharge of pollutional mine drainage to state waters should not be permitted unless the quality of receiving waters will not be violated, and discharges should be equated to fluctuations in flow; (6) mine-closing measures should minimize discharge of acid/toxic mine drainage; and (7) reuse of mine drainage for other purposes should be considered. (Hart-Florida)
W71-10961

PUBLIC HEARINGS (CERTAIN COMMISSION ACTION PREDICATED ON PUBLIC HEARINGS).
Kentucky Water Pollution Control Commission, Frankfort.
For primary bibliographic entry see Field 06E.
W71-10962

RULES FOR SITE LOCATION APPROVAL OF SEPTIC TANK SYSTEMS.
Colorado Dept. of Health, Denver. Water Pollution Control Commission.

1971. 6 p, 1 tab.

Descriptors: *Colorado, *Water pollution control, *Septic tanks, *Sewage disposal, Administrative agencies, Administrative decisions, Regulation, Water pollution, Water pollution sources, Water pollution effects, Water quality, Water quality control, Domestic wastes, Sewage bacteria, Cesspools, Sewage treatment, Pollutants, Pollution abatement, Soil contamination, Absorption, Sanitary engineering, Waste disposal, Public health, Human population.

The limited capacity of septic tank sewage-disposal systems to remove bacteria and viruses restricts their use to sparsely populated areas. Septic tanks must also be located a minimum distance from water supply wells and watercourses. The economic justification for public sewerage under various population densities is illustrated in this regulation. Septic tank sites must satisfy the following criteria established by the Colorado Water Pollution Control Commission: (1) a

percolation rate of at least 1 inch/hr; (2) pollution of contiguous property must be avoided; (3) sites must be 100 feet from any water supply well, 50 feet from any watercourse, and 10 feet from dwellings and property lines; (4) impervious strata must be 4 feet below absorption field trenches; and (5) septic tanks must comply with United States Public Health Service design standards. Seepage pits may be used where absorption fields are impractical. All proposed subdivisions must be submitted to the Commission for consultation on planned sewage treatment facilities. The Commission may identify portions of the state in which unregulated septic tank flow might cause pollution. In such areas, specific authorization for septic tank installation must be obtained. Violation of these regulations constitutes a misdemeanor punishable by fine. (Hart-Florida)
W71-10963

WATER QUALITY STANDARDS FOR SURFACE WATERS OF NORTH DAKOTA.
North Dakota State Dept. of Health, Bismarck.

North Dakota State Dep't of Health, Bismarck, ND (1970). 25 p, 39 ref.

Descriptors: *North Dakota, *Water quality, *Water quality control, *Standards, Aquatic microbiology, Biochemical oxygen demand, Color, Mineralogy, Nitrates, Nutrients, Odor, Public health, Radioactivity, Recreation, Taste, Water chemistry, Water pollution, Water pollution control, Waste treatment.

Water quality standards established for North Dakota are promulgated in this pamphlet. No untreated domestic sewage may be discharged into surface waters, and no untreated industrial wastes which may endanger public health or other users may be discharged. Furthermore, discharges are prohibited which may: (1) cause slime or sludge deposits, (2) create odors or color the water, (3) result in floating debris or scum, or (4) cause toxicity. Water quality standards for particular rivers are specified, including standards governing water usage, temperature, coliform organisms, acidity, designated chemical amounts, radioactivity, and unspecified substances in the waters of: (1) the Red River of the North, Boise de Sioux, Sheyenne, and Pembina Rivers; (2) the Missouri, Little Missouri, and Yellowstone Rivers, (3) the James River, and (4) the Souris and Des Lacs Rivers. (Hart-Florida)
W71-10964

ENFORCEMENT OF WATER POLLUTION LAWS IN OKLAHOMA.
Oklahoma Law Review, Vol 22, No 3, p 317-345 (1969). 29 p, 180 ref.

Descriptors: *Oklahoma, *Water pollution sources, *Administrative agencies, *Pollution abatement, Watercourses (Legal), Surface waters, Groundwater, Water supply, Water reuse, Water sources, Industrial wastes, Farm wastes, Sewage, Waste disposal, Waste treatment, Water users, Water quality, Standards, Wildlife conservation, Oil industry, Saline water intrusion, Toxins, Sediments, On-site investigations, Hydrologic cycle.

The article examines first the factors determining the nature and extent of water pollution: (1) the character of the state's water resources, their quality, quantity, and availability; and (2) the causes of water pollution categorized into the petroleum and other industries, agriculture, and municipal wastes. The second section of the article examines water pollution law as implemented by case law, legislation, or regulatory agencies' rules. Private remedies are discussed in regard to: (1) injuries to land and chattels; (2) nature of defendant's act; (3) nature of recovery; (4) plaintiff's standing; (5) defenses; (6) injury to water use rights; and (7) statute of limitations. The growth of a comprehensive state administrative program is explained. There are six agencies which administer this program: (1) the Pollution Control Coordinating Board has various coordinating functions; (2) the Water Resources Board performs industry plant inspections; (3) the Corporation Commission regulates the petroleum industry's activities; (4) the Health Department regulates the water supply and sewage disposal; (5) the Department of Agriculture regulates pesticides, and (6) the Department of Wildlife Conservation. (Rees-Florida)
W71-10965

NEW WINE IN OLD BOTTLES: THE FEDERAL REFUSE ACT PERMIT PROGRAM,
Joseph A. Towers.
Louisiana Bar Journal, Vol 18, No 4, p 243-249, 1971. 7 p, 11 ref.

Descriptors: *Rivers and Harbors Act, *Permits, *Water pollution control, *Administrative agencies, Waste disposal, Legislation, Federal government, Administrative decisions, Legal aspects, Water Quality Act, Pollution abatement, Navigable waters, Regulation, Adoption of practices, Administration, State governments, Oil wastes.
Identifiers: Water Pollution Control Act of 1970.

Pursuant to section 13 of the Refuse Act of 1899 and President Nixon's Executive Order Number 11574, the federal government will issue permits to regulate pollutants discharged into navigable waters of the United States. The Secretary of the Army has primary responsibility for regulating the program and evaluating permit applications. The Secretary is to coordinate his actions with the Environmental Protection Agency. The Chief of Engineers will issue permits utilizing three criteria: (1) impairment to navigation; (2) water quality standards; and (3) impact upon fish and wildlife resources. Applications will not be processed until a letter is received from the state counterpart to the Chief of Engineers describing the state's position on issuing a permit. Public notice and hearing are required for certain applications. Permits may not be issued for more than five years. The Refuse Act, enacted in 1899, applies to discharges not necessarily impeding navigation. The enactment of the Water Pollution Control Act, however, has greatly diminished the role of the Refuse Act by providing a comprehensive oil pollution abatement program. Therefore, no permits will be issued under the Refuse Act to discharge harmful quantities of oil. (Hart-Florida)
W71-10966

ECONOMIC INCENTIVES FOR POLLUTION ABATEMENT: APPLYING THEORY TO PRACTICE,
Kenneth R. Reed
Arizona Law Review, Vol 12, No 3, p 511-542, 1970. 32 p, 1 tab, 118 ref.

Descriptors: *Pollution abatement, *Economics, *Regulation, *Governments, Water pollution, Air pollution, Benefits, Cost allocation, Costs, Economic justification, Legal aspects, Resource allocation, Social aspects, River regulation, Permits, Standards, Waste disposal, Waste treatment, Water pollution treatment, Waste water treatment, Water pollution control, Financing, Taxes.

This article examines pollution in economic terms, identifies the major categories of control, and examines the use of economic incentives as a means of encouraging abatement by industry. The economic view of pollution sees the resulting damage to the environment as the result of a breakdown in the market economy. The major problem is to force the polluter to bear the economic costs of his actions directly rather than shifting these costs to society via pollution. Governmental pollution abatement efforts are classified into three areas: (1) regulation of the polluter through establishment of minimum standards, (2) subsides in the form of tax incentives by both the federal and state governments, and (3) waste discharge fees. Various state tax systems are examined; the relief provisions are deemed to reduce the polluter's economic cost of abatement but fail to satisfy the underlying need for an actual incentive to reduce pollution. After studying a German system and a recent Vermont anti-pollution system, the most desirable form of pollution control is deemed to be a system of emission charges which creates incentive for abatement. (Horwitz-Florida)
W71-10967

WATER POLLUTION CONTROL IN WASHINGTON,
L. A. Powe, Jr.
Washington Law Review, Vol 43, No 1, p 425-453, 1967. 29 p, 190 ref.

Descriptors: *Washington, *Water pollution control, *Pulp wastes, *Administrative agencies, Regulation, Legislation, Legal aspects, Water law, State governments, Water pollution, Effluents, Water quality control, Standards, Waste disposal, Pulp and paper industry, Sulfite liquors, Environmental engineering, Waste treatment, Political aspects, Pollution abatement, Water pollution sources, Permits, Federal government, State jurisdiction, Supervisory control (Power), Institutional constraints.

Water pollution control authority in the state of Washington is vested in the Washington Pollution Control Commission. This comment examines the Commissions's attempts to secure improved water quality in Puget Sound. Prior to 1955, the Commission did not utilize its legal powers but relied primarily on the use of persuasive pressure to secure compliance with its regulations. The pulp mills, Washington's largest polluters, generally cooperated with the Commission. A 1955 statute, however, required permits for industrial discharges of waste into state waters. The Commission was authorized to issue permits conditioned upon water quality standards designed to prevent undue pollution. The pulp industry was unwilling to comply voluntarily when the standards were tightened. This case study details the legal questions raised by the pulp industry and the efforts of the Commission to secure compliance. Such efforts included a federal-state conference, a five-year study of the problem, and new state and federal legislation. Although complete pollution abatement has not been attained, future enforcement of water quality standards appears more likely due to new legislation and the Commission's increased expertise. (Johnson-Florida)
W71-10968

WATER POLLUTION: AN AFFIRMATIVE RESPONSE BY THE CALIFORNIA LEGISLATURE,
Ronald B. Robie.
Pacific law Journal, Vol 1, No 1, p 2-35, 1970. 34 p, 181 ref.

Descriptors: *California, *Water pollution control, *Administrative agencies, *Water policy, Abatement, Pollution abatement, Water quality control, Water pollution treatment, Water treatment, Waste treatment, Water Quality Act, Competing uses, Regulation, Legislation, Water permits, Control, Inspection, Legal aspects, Standards.

This article discusses in detail the provisions of the new California water pollution law and compares it with the old law. The new law provides a modern framework within which growth of the state's economy can be managed in a manner which enhances, rather than desecrates, the environment and water resources. Administration of the act remains in nine regional boards and the State Water Resources Control Board, whose power has been increased. The beneficial uses to be protected are enumerated and expanded to include esthetic

enjoyment, but waste disposal has been conspicuously eliminated. The powers and duties of the regional and state boards are discussed, along with the methods of enforcement and implementation of discharge requirements. Two of the more significant enforcement tools discussed are the cleanup provisions and the increased civil monetary remedies. The enforcement provisions are deemed sufficient to allow prompt punishment of violations. The two major problems not solved by the new law are considered to be a lack of sufficient funds and inadequate control over local land use policies. (Horwitz-Florida)
W71-10969

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

THE SIMULATED CITY: THE USE OF SECOND GENERATION GAMING IN STUDYING THE URBAN SYSTEM,
Envirometrics, Inc.
Peter House.
Socio-Economic Planning Sciences, Vol 4, p 97-106, 1970. 1 fig.

Descriptors: *City planning, *Computer models, Methodology, Cities, Simulation analysis, Planning.
Identifiers: *Gaming, *Urban system, Urban environment.

Solving the growing and pressing problems of those who live in and govern our urban environment require imagination, ability and foresight. A unified and creative approach to be effective needs to be undertaken jointly by the academic, business and government communities. Although gaming will not provide the ultimate solution to urban problems, it can give the educator, researcher, planner and administrator an effective, flexible approach with which to tackle urban problems and solutions. New gaming techniques are described, particularly, environmental and modular modeling. These operational simulations are computer-assisted models which combine the mathematical, role-playing and systemic aspects of earlier games. (Davis-Chicago)
W71-10529

PUBLIC INVESTMENT CRITERIA AND IDLE RESOURCES: A REGIONAL ANALYSIS,
Grinnell Coll., Iowa.
For primary bibliographic entry see Field 06B.
W71-10531

SYSTEMS ANALYSIS AS A TECHNIQUE FOR SOLVING SOCIAL PROBLEMS - A REALISTIC OVERVIEW,
California Univ., Berkeley.
For primary bibliographic entry see Field 06B.
W71-10534

URBAN IMPROVEMENT PROGRAMMING MODELS,
Barton-Aschman Associates, Inc., Chicago, Ill.
Darwin G. Stuart.
Socio-Economic Planning Sciences, Vol 4, p 217-238, 1970. 7 tab, 8 ref.

Descriptors: *City planning, *Analytical techniques, *Mathematical models, Mathematical studies, Methodology, Planning.
Identifiers: *Mathematical programming, Urban improvement, Objectives, Goals.

The potential application of mathematical programming in the evaluation of alternative urban plans and improvement programs is explored. After a brief review of past modeling efforts, an examination of the problems likely to be encountered in identifying and measuring specific objectives and programs is presented. The Model Cities Program is used as an example. A simple linear programming model is subsequently developed, built around a matrix of relative effectiveness coefficients, a set of performance standards, and appropriate program budgets. Finally, potential applications of the model are surveyed, and examples of its use in testing and evaluating basic Model Cities programs and objectives presented. This exploratory study attempts to draw several basic guidelines for continuing research effort. First, the need for consistency and comparability in the selection of quantitative measures or indices of goal achievement is examined. Second, the need to express alternative programs and policies in terms of three essential characteristics - the objectives to which they are related, the impact or effectiveness which they will have in achieving each objective, and the costs associated with varying levels of effectiveness - is illustrated. Third, it is essential that a common measure of goal achievement must be developed. Fourth, it must be understood that programs-objectives effectiveness matrices of this type will require a prodigious amount of supporting research and analysis in order to predict the individual impacts of alternative programs and policies. Finally the sensitivity analysis of all variables and parameters within a mathematical programming problem can provide a good deal of information on relative costs, effectiveness and trade-offs. (Davis-Chicago)
W71-10536

TESTIMONY FOR THE DEFENSE - A CASE FOR COMPUTERS,
Vitro Labs., Silver Spring, Md.
Alan L. Weiser.
Socio-Economic Planning Sciences, Vol 4, p 407-414, 1970. 7 ref.

Descriptors: *City planning, *Management, *Decision making, Computer models, Computer programs, Planning.
Identifiers: *Computer technology, Public management.

An indictment has been lodged against computers, claiming that computer system implementation tends to usurp attention away from the more pressing problems of urban planning. Furthermore, it has been charged that computers should not be permitted a role in high level bureaucratic and legislative decision making. The troubled times which our cities are experiencing bear bitter witness to the fact that past independent, intuitive judgement has not satisfactorily met the challenge of urban societal planning. Computer technology, coupled with technical advances in urban sciences, provides a powerful tool for use in creative public management. It is administratively inefficient use of resources to relegate the computer to handle only routine clerical tasks. (Davis-Chicago)
W71-10537

AN OPTIMUM PATH TO RESERVOIR DESIGN BASED ON THE WORTH OF DATA,
Geological Survey, Fort Collins, Colo. Engineering Research Center.
For primary bibliographic entry see Field 04A.
W71-10573

DEVELOPMENT OF A STATE WATER-PLANNING MODEL: PART I - METHODOLOGY,
Montana Univ., Bozeman. Joint Water Resources Research Center.
Donald W. Boyd, and Theodore T. Williams.
Available from the National Technical Information Service as PB-201 694, $3.00 in paper copy, $0.95 in microfiche. Report 15, April 1971, 107 p, 3 fig, 7 ref, 13 append. OWRR Project B-029-MONT (2)

Descriptors: *Planning, *Methodology, *Systems analysis, *Model studies, Montana, Mathematical models, River basins, Hydrologic models, Computer models, Data collections.
Identifiers: Correlation model, Balance model, Peripheral model, Data requirements.

Expertise from the fields of hydrology and operations research was combined to produce a 'State Water-Planning Model'. Begun in September 1968, completion is scheduled for June 1972. The mathematical model, intended for solution by digital computer, is being designed for the Montana State Water Resources Board, and will be operated in conjunction with their data bank. The combination is envisioned to provide a system which can be interrogated to determine quickly and accurately the likely effects on the State's water regime of proposed changes in management practices. This report details the methodology that was formulated to develop a State Water-Planning Model, the first phase of which encompassed the whole of Montana and included all portions of those river basins contained within its political boundaries. First, a correlation model; second, a balance model; and third, a peripheral model were developed to illustrate general and procedural guidelines. (Holje-Montana)
W71-10641

VERIFICATION OF MODELS AND BASIC DATA USED IN THE MANAGEMENT AND CONTROL OF WATER QUALITY,
Washington State Univ., Pullman. Water Research Center.
For primary bibliographic entry see Field 05G.
W71-10646

A MODEL FOR SIMULATING RESIDENTIAL DEVELOPMENT IN RESERVOIR RECREATION AREAS,
North Carolina Univ., Chapel Hill. Water Resources Research Inst.
Raymond J. Burby, III, Thomas G. Donnelly, and Shirley F. Weiss.
Available from the National Technical Information Service as PB-201 750, $3.00 in paper copy, $0.95 in microfiche. Report No. 52, North Carolina Water Resources Research Institute, Raleigh, May 1971, 137p, 3 fig, 16 tab, 21 ref, 5 append. OWRR Project B-012-NC (9).

Descriptors: *Reservoirs, Impoundments, *Recreation, *Reservoir sites, Land development, Land use, Land ownership, Urbanization, *Model studies, Simulation analysis, Southeast US.
Identifiers: *Residential development, *Reservoir recreation.

The demand for water-oriented recreational land has rapidly increased over the past 25 years. This demand extends beyond the day and weekend usage typical of intermediate recreation facilities to a growing desire by households for primary and vacation homesites in reservoir areas. The limited knowledge of land development processes in the vicinity of reservoirs and the suddenness of the vacation home 'explosion' have generally limited the extent to which interrelationships among land and water uses and the service and regulatory requirements of shoreline residential development have been anticipated prior to reservoir impoundment. Given the expected growth in demand for residential land in reservoir areas, a reliable, objective method of forecasting development is clearly required. The land development simulation model presented in this report is addressed to this need. The model simulates reservoir area residential location patterns through a randomizing procedure in which households are assigned to sites on the basis of the supply of land available and its attractiveness for recreational and permanent residential use. The specification of sites, supply of land, and number of households to be allocated are exogenous inputs to the model. They describe both the supply and demand for reservoir area land and, through the effects of policy measures on available land and its attractiveness, the potential leverage which reservoir owners and public officials can exert on the development process. Operating on these inputs, the computer program selects units of development to be allocated, sequentially examines

each site in a reservoir area, notes the combined effect of the amount of vacant land and its attractiveness for development, and decides on a probabilistic basis where development is to be allocated. (See also W71-10757).
W71-10758

APPLICATION OF A LARGE SCALE NONLINEAR PROGRAMMING ALGORITHM TO POLLUTION CONTROL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 05G.
W71-10799

SYSTEMS ANALYSIS FOR GROUNDWATER MANAGEMENT, PHASE II,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W71-10850

OPTIMUM CONJUNCTIVE USE OF A DUAL-PURPOSE DESALTING PLANT AND A SURFACE WATER RESERVOIR,
California Univ., Los Angeles. Dept. of Engineering Systems; and Chile Univ., Santiago.
For primary bibliographic entry see Field 03A.
W71-10852

ASSESSMENT ANALYSIS FOR WATER SUPPLY ALTERNATIVES,
Corps of Engineers, Alexandria, Va. Inst. of Water Resources; and Colorado State Univ., Fort Collins; and Washington State Univ., Pullman.
A. Bruce Bishop, David W. Hencricks, and James H. Milligan.
Water Resources Bulletin, Vol 7, No 3, p 542-553, June 1971. 12 p, 5 fig, 3 tab, 14 ref.

Descriptors: *Water supply, *Water reuse, *Systems analysis, *Linear programming, Optimization, Costs, Time, Utah.
Identifiers: *Salt Lake City (Utah).

The objective was to outline a methodology to assess the full range of alternatives in water supply development, including reallocation, reuse, and importation, and to determine the amount and time sequence for development of water supply sources. This was done by a systems analysis of the water supplies available, and the optimizing objective was to minimize cost or to maximize net benefits, as the analyst desired. In conceptualizing the problem, sources of supply were classified in three categories: primary or base supplies, secondary or effluent supplies, and supplementary or imported supplies. A model of the water system was formulated as a 'transportation problem' in linear programming, depicting the possible sources of supply which could be used to satisfy the requirements of various water users. A case study of the Salt Lake City, Utah, area was used to illustrate the application of the model in obtaining optimal water supply allocations for projected future demands. Assessment of alternatives in the study included redistribution of supplies, time-staging and related treatment facilities, and sensitivity of allocations to changes in costs. (Veverka-Cornell)
W71-10858

OPTIMAL CAPACITIES FOR A MULTIRESERVOIR SYSTEM USING THE LINEAR DECISION RULE,
Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 04A.
W71-10862

EXPERIENCE WITH THE PARTIAL DIFFERENTIAL EQUATION LANGUAGE PDEL: AN ALTERNATIVE TO HYBRID COMPUTATION,
California Univ., Los Angeles. Dept. of Computer Science.
For primary bibliographic entry see Field 07C.
W71-10863

SOME EFFICIENT DYNAMIC PROGRAMING ALGORITHMS FOR THE OPTIMAL SEQUENCING AND SCHEDULING OF WATER SUPPLY PROJECTS,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Operations Research.
Thomas L. Morin, and Augustine M. O. Esogbue.
Water Resources Research, Vol 7, No 3, p 479-484, June 1971. 6 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Water resources development, *Dynamic programming, *Scheduling, Optimization.

The sequencing and scheduling aspects of some important capacity expansion problems encountered in water resources development were studied. Dynamic programming algorithms were developed for both project timing problems and combined project selection and timing problems involving durable high cost water supply projects, which in the aggregate were subject to continuous time demand requirements. The structure of the problems was successfully exploited to produce computationally efficient algorithms to solve problems of the dimension encountered in water resources systems. The computational superiority of these algorithms over conventional dynamic programming algorithms was discussed and illustrated by a numerical example. (Veverka-Cornell)
W71-10864

A FAST FRACTIONAL GAUSSIAN NOISE GENERATOR,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
Benoit B. Mandelbrot.
Water Resources Research, Vol 7, No 3, p 543-553, June 1970. 11 p, 1 fig, 4 tab, 14 ref.

Descriptors: Markov processes, *Statistical models, Stochastic processes.
Identifiers: *Gaussian noise generator.

By design fast fractional Gaussian noises (ffGn) had the following characteristics: (1) The number of operations needed to generate them was relatively small; (2) The long run statistical dependence that they exhibited was strong and had the form required for self-similar hydrology; (3) Their short run properties, as expressed by the correlations between successive or nearly successive yearly averages, were adjustable (within bounds) and could be fitted to the corresponding short run policies of records; (4) Extension to the multidimensional (multisite) case raised no essential difficulty; and (4) Their definition, as sums of Markov-Gauss and other simple processes, fit the intuitive ideas that climate could be visualized as either unpredictably inhomogeneous or ruled by a hierarchy of variable regimes. (Veverka-Cornell)
W71-10865

OPTIMAL PLANS FOR THE CAPACITY EXPANSION OF A MUNICIPAL WATER-TREATMENT-DISTRIBUTION SYSTEM,
Illinois Univ., Urbana. Dept. of Business Administration.
For primary bibliographic entry see Field 05F
W71-10866

POWER OF OPTIMIZATION FOR PRESCRIBED THERMAL POLLUTION,
Newark Coll. of Engineering, N.J.
For primary bibliographic entry see Field 05G.
W71-10868

SIMULATION MODELS OF WATER SUPPLY FOR IRRIGATION IN WATER RESOURCES SYSTEMS,
For primary bibliographic entry see Field 03F.
W71-10870

AN AGGREGATIVE MODEL FOR MUNICIPAL ECONOMIC PLANNING,
Virginia Polytechnic Inst., Blacksburg. Coll. of Business.
For primary bibliographic entry see Field 06B.
W71-10871

SOME FACTORS INFLUENCING REQUIRED RESERVOIR STORAGE,
Washington Univ., Seattle; and Stanford Univ., Calif.
For primary bibliographic entry see Field 04A.
W71-10872

APPLICATION OF STATISTICAL DECISION THEORY TO WATER USE ANALYSIS IN SEVIER COUNTY, UTAH,
Utah State Univ., Logan. Dept. of Economics.
Jay C. Andersen, Harold H. Hiskey, and Suwaphot Lackawathana.
Water Resources Research, Vol. 7, No. 3, p 443-452, June 1971. 10 p, 1 fig, 7 tab, 17 ref.

Descriptors: *Water utilization, *Water supply, *Statistical methods, *Farm management, Optimization, Crops, Reservoir yield, Utah.
Identifiers: *Sevier County (Utah), *Bayesian decision theory.

Statistical or Bayesian decision theory was applied to a farm management situation in Sevier County, Utah, which was characterized by risk and uncertainty with respect to the supply of late season water. The objectives of the study were to: (1) demonstrate the usefulness of the Bayesian theory in measuring the magnitude of differences among alternative actions and (2) evaluate as an isolated annual decision the question of what was the optimum crop rotation. Information on reservoir carry-over and mountain snowpack became available just before resources were committed. These data were incorporated into the model as predictors of the late season water supply. Use of this predictive information was compared to the 'no data' situation, in which the predictive information was not used, and also to the 'perfect knowledge' situation, in which the availability of full information at the time of resource commitment was assumed. A limited growing season and other physical constraints along with lack of markets restricted the flexibility of the management decisions so that the profitability of adapting the technique was not great in the present application. However, the technique was shown to be usable and potentially profitable in a variety of management situations. (Veverka-Cornell)
W71-10874

AN ALGORITHM FOR IRRIGATION PROJECT PLANNING,
Harvard Univ., Cambridge, Mass. Centre for Population Studies.
For primary bibliographic entry see Field 03F.
W71-10875

OPTIMUM PUMPING CONDITIONS FOR WELLS LOCATED IN UNCONFINED COASTAL AQUIFERS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 04B.
W71-10876

GENERALIZED ANALYSIS OF SMALL WATERSHED RESPONSES,
California Univ., Davis. Dept. of Water Science and Engineering
For primary bibliographic entry see Field 04D.
W71-10877

USER'S MANUAL FOR THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL IV,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-10878

SOLUTION OF OPTIMIZATION PROBLEMS IN THE DEVELOPMENT OF WATER UTILIZATION SCHEMES EMPLOYING NONLINEAR PROGRAMMING,
L. G. Goruleva.
Translated from: Gidrotekhnicheskoe Stroitel'stvo, No. 10, p37-39, October 1970. Hydrotechnical Construction, No. 10, p 952-955, October 1970. 4 p, 3 fig, 1 tab, 4 ref.

Descriptors: *Water utilization, *Optimization, *Economics, Mathematical models.
Identifiers: *Non-linear programming.

To determine the economic return of water utilization schemes, a large number of variants, corresponding to different rates and levels of utilization resources by the individual components of the scheme, was examined, and the effect of these factors on the efficiency of the scheme was analyzed. The solution of these problems required the application of economic-mathematical procedures. A study was made for the determination of the duration and moment of initiation of construction of optimum substituted installations. This problem consisted of minimizing the target expenditure function with the corresponding limitations. It was concluded that (1) the problem of optimization of the construction period of substituted installations in the case of long commissioning periods for the water utilization scheme, because of non-linearity of the target function and limitations, was a problem of non-linear programming; (2) distribution of expenditures on the substituted variants over the course of time might be represented approximately; and (3) the problem of optimization of the parameters of the substituted variants, employing the procedures adopted for approximating the expenditures, was reduced to seeking their conditional minimum. (Veverka-Cornell)
W71-10879

ECONOMIC METHODS AND CRITERIA USED FOR THE OPTIMIZATION OF CAPITAL INVESTMENTS IN WATER MANAGEMENT,
A. A. Beschinskii, and A. Sh Reznikovskii.
Translated from: Gidrotekhnicheskoe Stroitel'stvo No. 9, p27-33, September 1970. Hydrotechnical Construction, No. 9, p 828-835, September 1970. 8 p.

Descriptors: *Water management (Applied), *Economic efficiency, Capital, Optimization, Planning.
Identifiers: *USSR.

Three stages of analysis were shown to justify the convenience of the solutions adopted in economic appraisals in the field of water management: (1) Justification of the allocation of government funds for different branches of water management in a country or region; (2) Economic evaluation and selection of technical solutions for the adopted water-management plan; (3) Economic selection of the parameters for the adopted projects or technical solutions. It was concluded that the need for wider utilization of electronic computers and modern mathematical methods of optimization was present in the USSR, as well as the need for optimum administration of the development and operation of water-management systems in the hierarchical structure and organizational forms of administration. One of the most important practical problems in water management was the definite improvement of the procedures for distributing capital and operating costs among the different participating components in an integrated development (alternatives, etc.) and their conversion into financial solutions. For the successful solution of the problem of optimization of integrated water-management systems, it was necessary to unify the procedures utilized by the different participants in the integrated developments for justifying the economic effectiveness of their solutions. It was suggested that in major water-management and hydropower construction a high standard coefficient of effectiveness in comparison to the coefficients used in the national economy be adopted. (Veverka-Cornell)
W71-10880

6B. Evaluation Process

A REVIEW OF ACTIVITIES--1966-1971.
Massachusetts Univ., Amherst. Water Resources Center.

Publication No. 14, 1971. 102 p. OWRR Project A-999-MASS (8).

Descriptors: *Water resources research act, *Massachusetts, *Universities, Allotments, Grants, Training, Water resources development, Contracts, Hydrologic cycle, Water pollution, Water supply, Social aspects, Water management (Applied), Planning, Hydrologic data, *Research and development.

Information is provided on the work of the University of Massachusetts Water Resources Research Center from its inception in late 1965 to the Spring of 1971. The Center's goals and the nature of research, training, and public service relevant to these goals are described. Problems in Massachusetts requiring research effort are described, and a brief digest of all Center projects, past and current, is presented. The objective of the Water Resources Research Center at the University of Massachusetts is: (1) to define existing and emerging water resources problems and to support research directed to their solution; (2) to assist in training professional workers for careers in water resources fields; and (3) to assist agencies and individuals concerned with decisions on protection and use of the State's water resources. (Knapp-USGS
W71-10450

PHYSICAL ENVIRONMENT AND ITS SIGNIFICANCE FOR ECONOMIC DEVELOPMENT, WITH SPECIAL REFERENCE TO ETHIOPIA,
Sven Behrens.
Svensk Geografisk Arsbok, Vol 46, p 77-113, 1970. 7 fig, 26 ref.

Descriptors: *Natural resources, *Surveys, *Terrain analysis, *Environmental effects, *Economic feasibility, Geomorphology, Social aspects, Vegetation effects, Mountains, Rainfall, Runoff, Soil texture, Soil stability, Erosion, Forests, Exploitation, Climatic data, Geological formations, Ecology, Hydroelectric power, River basins, Tropical regions, Arid lands, Water resources, Water resources development, Land use.
Identifiers: *Ethiopia, *Developing countires.

In analyzing the important factors in the developing process of a country, it is argued that physical factors are critically important. There are independent basic physical elements and interacting physical variables influencing on each other and on various human activities. Ethiopia is a tropical country with unusually great physical diversity ranging from arid regions to alpine regions due to vertically applied geological forces. The steep relief of much of the country combined with a high rainfall season in the highlands and fertile soils with low water absorptive capacities result in high runoff levels and a high soil erosion potential. Deforestation and a long dry season limit plant cover and humus buildup. The river basins are steep and narrow, limiting irrigated agricultural potential, but have great hydroelectric potential. In assessing the physical resources of the country a detailed genetic approach is applied and the main environmental factors discussed are: location, geology, relief, climate, soils, vegetation, water and mineral resources. In each case their interacting significance in economic development is considered. A major effort is made to pinpoint critically needed projects and to show why a 'rich potential' of a developing country is not always easily transformed into high productivity. (Casey-Arizona)
W71-10498

THE PHYSIOGRAPHIC REGIONALIZATION OF NORTHERN ETHIOPIA (IN GERMAN),
Carl Troll.
English summary. Erdkunde, Vol 24, No 4, p 249-268, December 1970. 4 fig, 1 tab, 32 ref.

Descriptors: *Orography, *Geomorphology, *Rainfall, *Geologic formations, *Climatic data, Altitude, Tropical regions, Arid lands, Humid areas, Vegetation, Geographical regions, Seasonal, Topography, Reservoirs, Cloud cover, Ecological distribution, Evaporation, Basalts.
Identifiers: *Eritrea, *Tilt blocks, *Ferric crust formations.

A tilt block of the Nubian-Arabian Shield rises from the Sudan lowland up to a maximum of 3250 m., forming the highland of Northern Ethiopia (Eritrea). From Asmara, southwards it is overlain by various sedimentary and volcanic formations and a thick basaltic trap cover which forms a prebasaltic peneplain. The peneplain is marked by an erosion-resistant ferric crust formation resulting in table mountains and plateaus with very well-defined edges. Climatologically, the region is unusual, having an orographic zonation of seasonal precipitation superimposed upon a thermal altitudinal division. The western slopes and high tablelands (Altiplano) receive summer rains while on the eastern slopes of the highlands summer and winter rains overlap. At the edge of the overlap on the altiplano, heavy winter cloud and mist fronts occur. Near Asmara, reservoirs have been built which collect summer rains and store them for irrigation during the rainless winter. The heavy winter fogs act to minimize reservoir water loss by evaporation. The plant cover shows all possible aridity--humidity contrasts because of the juxtaposition of summer rain and winter rain climates in a region with small temperature variations. Vegetation types with phenologically inverted relationships therefore exist on the edge of the altiplano and the hot steppes. Increases in vegetation towards the south result in a descent of the upper limit of aridity. (Casey-Arizona)
W71-10499

COMMUNITY RESOURCE DEVELOPMENT: EMPHASIS FOCUSES ON ECONOMIC DEVELOPMENT OF RURAL COMMUNITIES; RECREATION AREAS DEVELOPED AS TOURIST ATTRACTIONS,
Nevada Univ., Reno. Agricultural Extension Service.
For primary bibliographic entry see Field 03F.
W71-10501

SPATIAL ORGANIZATION OF AGRICULTURE IN SOME NORTH INDIAN VILLAGES. PART I,
Reading University, U.K., Geography Department.
Reading Univ., (England). Dept of Geography.
For primary bibliographic entry see Field 03F.
W71-10503

ASSESSMENT ANALYSIS FOR WATER SUPPLY ALTERNATIVES,
Army Corps of Engineers, Washington, D.C.
A. Bruce Bishop, David W. Hendricks, and James H. Milligan.
Water Resources Bulletin, Vol 7, No 3, p 542-553, June 1971. 5 fig, 3 tab, 14 ref.

Descriptors: *Analytic techniques, *Water supply, *Linear programming, Systems analysis, Planning, Evaluation, Optimization, Water reuse, Model studies, Water allocation (Policy).
Identifiers: Water importation.

Providing adequate water supplies of good quality is becoming a serious problem in many areas of the United States. Some of the alternatives proposed for meeting the growing shortage of clean-water or cheap-water are reallocation, reuse, and importation. A methodology is outlined to assess all of these water supply alternatives by examining the amount and time-staging for development of water sources. In conceptualizing the problem, sources of supply are classified in three categories: primary or base supplies, secondary or effluent supplies, and supplementary or imported supplies. A model of the water system is formulated as a 'transportation problem' in linear programming depicting the possible sources of supply which can be used to satisfy the requirements of various water users. The optimizing objective in the model is to minimize the cost of water under various assumptions for operating the system. A case study of the Salt Lake City, Utah, area is used to illustrate the application of the model in obtaining optimal water supply allocations for projected future demands. Assessment of alternatives in the study include redistribution of supplies, time-staging of supplies and related treatment facilities, and sensitivity of allocations to changes in costs. (Davis-Chicago)
W71-10511

THE EFFECT OF PRICE ON LONG RUN WATER SUPPLY BENEFITS AND COSTS,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
Marshall Gysi.
Water Resources Bulletin, Vol 7, No 3, p 521-528, June 1971. 2 tab, 7 ref.

Descriptors: *Water supply, *Pricing, *Benefits, *Costs, *Operations research, *Dynamic programming, *Long-term planning, Mathematical models, Optimization, Economics, Planning, Water demand.
Identifiers: *Long-run costs, *Pricing policies, Capacity expansion path.

The long-term effects of presently used and alternatively proposed water pricing policies were studied using some tools of operations research and economics. A discrete deterministic dynamic programming model was structured and operated to determine the optimal water supply capacity expansion paths for a hypothetical residential community with a given water pricing policy. The objective of the model was the maximization of future discounted consumers' surpluses plus producer's revenues net of the long-run cost of supply. State variables were the size of system capacity in MGD and stage variables were the times of feasible capacity increase in years. Demand curves, population sizes, and growth rates for various economic sectors of the community were assumed known, as well as short-run production and capital construction costs. Several policies, including constant unit rates, decreasing or increasing block rates and summer differential rates were tested. It was concluded that price plays a major role in the short-run allocation and long-run planning and conservation of water supplies. Conservational pricing policies were advocated as means of lowering the long-run cost of water, using the water price-demand function as a planning tool. (Davis-Chicago)
W71-10513

STRATEGY FOR DYNAMIC REGIONAL WATER RESOURCES PLANNING AND IMPLEMENTATION,
Colorado Univ., Boulder.
J. Ernest Flack.
Water Resources Bulletin, Vol 7, No 3, p 517-520, June 1971. 2 ref.

Descriptors: *Planning, *Water resources development, *Decision making, *Social aspects, Political aspects, Optimization, Formulation.
Identifiers: *Water resources planning, *Implementation, Social participation, Conflict resolution, Policy formulation, Goals, Objectives.

Water resources planning has emphasized the consideration of alternatives in the formulation of goals and objectives. With greater availability of data and projection models, optimization of plans is now much nearer to accomplishment. In contrast to these favorable aspects of planning, increased complexity of plans and large number of alternatives serving differing sets of goals have extended the time horizons from initial plan formulation to eventual implementation. In this paper a man-machine strategy is proposed to reduce the time required for decision making and conflict resolution. A panel of representatives of the decision makers, influentials and publics involved are selected and brought through a series of dynamic planning steps that simulate real time decision making. Computer interaction graphics is used to visualize the decision making process and to illustrate where and why conflict arises. A mechanism for resolution of conflict and retention of consistency in policy formulation using a cognograph is described. (Davis-Chicago)
W71-10514

A METHOD FOR INCORPORATING AGRICULTURAL RISK INTO A WATER RESOURCE SYSTEM PLANNING MODEL,
Florida Univ., Gainsville; and Texas A and M Univ., College Station.
J. R. Conner, R. J. Freund, and M. R. Godwin.
Water Resources Bulletin, Vol 7, No 3, p 506-516, June 1971. 4 fig, 3 tab, 22 ref.

Descriptors: *Water resources development, *Planning, *Risks, *Model studies, Mathematical models, Analytic techniques, Methodology, Simulation analysis, Irrigation.
Identifiers: *Water resources systems, *Agricultural risk, Risk programming.

Prior studies of water resource systems have considered risk from the point of view that only the system planners could react to the effects of the risk elements. However, users of water from a system also react to risk. When the quantity of water that a system can supply is subject to considerable variation, the reactions of the users of the water will often effect the benefits generated by the system and thus its optimal design characteristics. A simulation model of a reservoir-irrigation system is developed which incorporates the water users' reactions to risk in such a manner as to reflect their influence on the optimal design characteristics. A risk (convex) programming algorithm is incorporated into the model to reflect the water users' reactions to various levels of aversion to risk and degree of uncertainty in water deliveries. Response surfaces are generated as a result of performing the simulation at different levels of the design variables. An examination of these surfaces reveals the importance of including water users' reactions to risk in water resource planning. The effects of different levels of risk aversion on the irrigation farmers' choice of crop enterprises are also examined. (Davis-Chicago)
W71-10515

ENVIRONMENTAL ASSESSMENT REPORT.
Muskegon County Board, Mich.

Muskegon County Board, Muskegon, Michigan, March 1971. 47 p, 5 tab, 10 fig. EPA Demo Proj 11010 GFS.

Descriptors: *Environment, *Waste treatment, *Waste water disposal, *Irrigation, Water policy, *Conservation, Ecology.
Identifiers: *Environmental assessment, *Muskegon County, Water resources planning, Urban ecology.

The Muskegon County Wastewater Plan entails the collection and treatment of municipal and industrial wastewaters that are generated in the urban areas focusing on the dune impounded Mona, Muskegon, and White Lakes. Wastewater constituents are used as resources to be applied through irrigation to the land where they are used as a soil conditioner or as nutrients. The environmental impacts of the Plan are grouped and discussed under three headings: (1) impacts on the water resource, (2) impacts on the air resource, and (3) impacts on the land resource. The principle adverse environmental effects of the projects are the relocation of approximately 200 families living in the site area and the discharge of certain dissolved minerals not removed by the system to the Muskegon River and the Black Creek. In addition to the system currently being implemented, three alternatives were considered. Although the project entails the commitment of land resources, the land will not be degraded in the process of irrigation, but instead will be improved in fertility. (Wray-Chicago)
W71-10518

WATER QUALITY MANAGEMENT PLAN FOR THE BLACK RIVER BASIN.
Ottawa County Board of Commissioners (Ontario).
For primary bibliographic entry see Field 05G.
W71-10522

COMPUTERS AND URBAN PLANNING,
Pennsylvania Univ., Philadelphia.
Britton Harris.
Socio-Economic Planning Sciences, Vol 1, p 223-230, 1968. 3 ref.

Descriptors: *City planning, *Long-term planning, Computer models, Computer programs, Planning, Decision making, Short-term planning.
Identifiers: *Computer methods.

The use of computers in urban decision-making is examined in relation to the over-all structure of the planning process. A separation is made between activities which are well suited to scientific analysis and computer methods and those which are better suited to processes involving active human intervention. The major emphasis is on long-term planning problems rather than on short-term measures and adaptive controls. (Davis-Chicago)
W71-10525

PROGRAMMING OF RECREATIONAL LAND ACQUISITION,
Washington Univ., Seattle.
Robert C. Meier.
Socio-Economic Planning Sciences, Vol 2, p 15-24, 1968. 6 fig, 4 ref.

Descriptors: *Recreation facilities, *Linear programming, *Mathematical models, Planning, Recreation, Recreation demand, Optimization.
Identifiers: *Recreational land acquisition.

Population growth and increased use of facilities are placing heavy demands on available recreational lands. Since much of the funding for additional purchases comes from the state and federal level of government, it is necessary to plan for effective expenditures of funds over wide geographic areas. Supply, demand, availability of funds, recreational value, and other factors must be considered in developing a balanced program of recreational land acquisition. Linear programming models can be constructed which bring together into a rigorous mathematical framework many of the factors relevant to the planning of expenditures. The use of such models permits rapid computation of optimum acquisition programs, guarantees consistent and equitable treatment of possible acquisitions, and permits examination of the consequences of alternative assumptions. (Davis-Chicago)
W71-10526

SOCIAL INDICATORS AND SOCIAL ACCOUNTS,
Maryland Univ., College Park.
Mancur Olson.
Socio-Economic Planning Sciences, Vol 2, p 335-346, 1969. 2 ref.

Descriptors: *Planning, *Social aspects, *Statistics, Methodology, Decision making, Cost-benefit analysis.
Identifiers: *Social indicators, *Social accounts.

This paper defines 'social indicators' as statistics which have two defining characteristics. They are, first, measures of direct normative interest; that is what the economist would call measures of 'welfare' and 'illfare'. Most existing government statistics are not of this type, because a large proportion of existing statistics are measures of government or other institutional activity, produced as a by-product of accounting or administrative routine. The second defining characteristic of a social indicator is that it should fit into a systematic scheme of classification or aggregation which would make possible a balanced assessment of socio-economic progress or retrogression in some broad area, as well as disaggregated and detailed study of particular problems. Social indicators can also fit, with other statistics, into a set of 'policy accounts' or scheme of social accounting, which would relate social expenditures to the social indicator they were designed to affect. This would encourage broadened cost-benefit analysis and rational public decision-making. (Davis-Chicago)
W71-10527

WILL IT LAY ONE MORE BRICK,
Hunt's Point Management Corp., New York.
I. D. Robbins, and Allan Harvey.
Socio-economic planning Sciences, Vol 4, p 11-16, 1970.

Descriptors: *City planning, Computer programs, Computer models, Decision making, Planning.
Identifiers: *Computer methods.

There is no argument with the conviction that the computer can ease many burdens and extend many horizons. It would be much better, however, if the use of the computer in dealing with urban problems were solidly based on theories which hold the promise of major breakthroughs. Unfortunately, essential problems may remain unconsidered and therefore unsolved simply because the emphasis has been on finding ways to use the computer rather than on the problems themselves. (Davis-Chicago)
W71-10530

PUBLIC INVESTMENT CRITERIA AND IDLE RESOURCES: A REGIONAL ANALYSIS,
Grinnell Coll., Iowa.
Robert Haveman.
Socio-economic Planning Sciences, Vol 7, p 481-497, 1968. 4 fig, 5 tab, 23 ref.

Descriptors: *Evaluation, *Model studies, *Computer programs, Computer models, Planning, Costs, Decision making, Water resources development, Water resources.
Identifiers: *Leonteif balanced regional model, *Public investment policy, *Opportunity cost, *Water resource investment.

An operational model and a computer program is described by which projects can be re-evaluated in terms of their opportunity costs when regional or national unemployment rates depart from frictional minima. This model is a modified form of the Leonteif balanced regional model. The regional distribution of occupational and industrial demands imposed on the economy by public water resource investments located in any region was estimated and a basis for adjusting the money costs of project construction in periods or regions of less than full employment was developed. Through the use of this model, more discriminating judgement can be applied to public investment policy in general and especially public investment policy in the chronically depressed, high unemployment, and declining areas of the nation. (Davis-Chicago)
W71-10531

THE RENEWABLE RESOURCE PLANNING PROBLEM,
Saint John's Coll., Oxford (England).
M. K. Muthoo.
Socio-Economic Planning Sciences, Vol 4, p 187-200, 1970. 1 fig, 1 tab, 9 ref.

Descriptors: *Planning, *Systems analysis, Ecology, Economics, Mathematical models, Social aspects, Institutional constraints, Economic impact.
Identifiers: *Renewable resources, *Interdisciplinary studies.

This paper focuses attention on the interdisciplinary nature of the problem of planning renewable natural resource use for socio-economic development. The disciplines involved are (a) ecology, for bio-technical assessment of the use-possibility of a resource base; (b) sociology, for considering the social, cultural, and institutional constraints in an area; and (c) economics, for evaluating and ranking the uses in an order of priority for meeting developmental aims. The integration of the three disciplines for the preparation of an optimal plan can be achieved by systems analysis with the help of a mathematical programming model. The essential feature of the model would be the incorporation of a quantitative relationship between social costs and social benefits of options, e.g. social benefit: cost ratio, as the objective function. The maximization of the function would be subject to the constraints of (a) the social, cultural and institutional factors quantified as restrictions of demand for different commodities and minimum levels of employment or incomes to producers vis-a-vis their present occupations, and of (b) the renewable resource potential quantified in terms of output of various commodities possible with different feasible technologies. (Davis-Chicago)
W71-10532

THE USE OF COMPUTER GRAPHICS IN THE HUDSON RIVER VALLEY,
Hudson River Valley Commission, Tarrytown, N.Y.
For primary bibliographic entry see Field 07C.
W71-10533

SYSTEMS ANALYSIS AS A TECHNIQUE FOR SOLVING SOCIAL PROBLEMS - A REALISTIC OVERVIEW,
California Univ., Berkeley.
Ida R. Hoos.
Socio-Economic Planning Sciences, Vol 4, p 27-32, 1970. 6 ref.

Descriptors: *Systems analysis, *Analytic techniques, *Social aspects, Methodology, Planning, Cost-benefit analysis.
Identifiers: *Social problems, Social planning, Program budgeting.

Drawing on case materials from completed and ongoing systems analyses, this paper presents an empirical assessment of the current and growing trend toward the utilization of this and related quantitative techniques, such as cost/benefit measures and program budgeting, in social planning. The first section is devoted to examination of the bases for and assumptions underlying the general acceptance and ubiquitous application of the systems approach; the second deals with the concepts of systems analysis and related techniques; and the third with that technique through which systems management capability is transferred from the private to the public sector. The final section contains a critical appraisal of systems techniques as currently applied to social problems. (Davis-Chicago)
W71-10534

SOCIAL INDICATORS IN PERSPECTIVE,
International Bank for Reconstruction and Development, Washington, D.C.
Nake M. Kamrany, and Alexander N. Christakis.
Socio-Economic Planning Sciences, Vol 4, p 207-216, 1970. 1 fig, 16 ref.

Descriptors: *Planning, *Methodology, *Social aspects.
Identifiers: *Social indicators, *Policy planning.

Part I discusses the need for the development of an adequate barometer (social indicators) to measure the overall wellbeing of nations. Part II expounds upon the major dimensions of a social indicator. Part III proposes a conceptual framework for a practical approach embodying social indicators in a framework of national policy planning and priority setting. (Davis-Chicago)
W71-10535

WATER RESOURCES MANAGEMENT PLAN FOR MCHENRY COUNTY,
Bauer Engineering, Inc., Chicago, Ill.
John R. Shaeffer.
McHenry County Regional Planning Commission, Woodstock, Illinois, April 1971. 111 p, 18 tab, 29 fig, append.

Descriptors: *Waste water treatment, *Drainage, *Agriculture, *Management, Natural resources, Water policy, Solid wastes, Streamflow, Resource development.
Identifiers: *Water resources management, *Urban drainage, *Rural-agricultural drainage, *Streamflow management, Solid waste disposal, Land disposal-spray irrigation, Closed system management, Watershed development capacity.

The conceptual plan and framework for the management of water resources in McHenry County, Illinois are described. The water resource elements considered are water supply, wastewater treatment, urban drainage, rural-agricultural drainage, and streamflow management. Four building blocks of the program are: (1) present problems and goals, (2) present water resources and systems, (3) future water resources management needs, (4) water resource management opportunities. Opportunities considered include the land disposal-spray irrigation method of waste water treatment, comprehensive drainage, management, streamflow management, and the disposal of solid wastes in conjunction with land disposal and treatment of waste water. The conceptual plan framework makes recommendations regarding: goals, evaluation criteria, and participation-leadership roles. It also specifies two guiding principles: closed system management and watershed development capacity. A key aspect of the plan is the management of waste water through land disposal-spray irrigation. Implementation recommendations include the formulation of a County Department of Public Works and a multi-phased continued development of water resources management programs. (Wray-Chicago)
W71-10538

INSTITUTIONAL PATTERS IN EVOLVING REGIONAL PROGRAMS FOR WATER RESOURCE MANAGEMENT,
Massachusetts Univ., Amherst. Water Resources Research Center.
I. Howards, and E. R. Kaynor.
Available from the National Technical Information Service as PB-201 652, $3.00 in paper copy, $0.95 in microfiche. Publication No 15, 1971, 238 p, 11 fig, 1 tab, 90 ref, 4 append. OWRR Project B-003-MASS (1).

Descriptors: *Institutions, *Regions, *Cities, *Planning, *Political aspects, *Water supply, *Local governments, Organizations, Administrative agencies, Institutional constraints, Management, Water resources development, Water policy, Political constraints, Massachusetts, Urbanization, Michigan, City planning, Connecticut, Social aspects, Competing uses, Governments.
Identifiers: Boston, Detroit, Springfield (Mass), Hartford (Conn).

Research attempted to determine what actually occurs at the local level of government in the process of planning and implementing water resource proposals and what relationship exists between the local level of government and the type of community in which water resource decisions are made. Four metropolitan water supply systems were studied: Boston, Mass; Detroit, Mich; Springfield, Mass; and Hartford, Conn. Five specific water supply conflict situations were compared and a statistical study was made of the relationship between certain community profile characteristics and four attributes of local water service in Massachusetts. Water supply service is affected by : the size of population concentration, thereby creating 'need' for a public water system; by geography, thereby affecting technical feasibility; by the way in which the water service agency is administered (including especially the form of agency organization, its authority to act, and the legal constraints under which it operates): by the agency's relationship to other agencies; by the type of government under which the agency operates; and by the type of community within which water service decisions are made (including the community's socioeconomic and political characteristics). The most important factors were the geologic, demographic, socioeconomic, and political 'base' within the administrative agency functions.
W71-10642

THE GEOLOGICAL SURVEY AND WATER FOR SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. E. Miller.
Geological Survey Report, January 21, 1971. 15 p, 6 fig.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Reviews, *California, Programs, Projects, Hydrology, Urbanization, Groundwater recharge, Reservoirs, Saline water intrusion, Land subsidence, Floods, Cooperatives, Data collections.
Identifiers: *US Geological Survey, *Southern California, Hydrologic summary.

The U.S. Geological Survey's role in water resources development of southern California is reviewed. Summary topics include water resources studies, hydrologic inventories, water resources appraisal, water management models, urban hydrology, artificial recharge, surface reservoirs, sea-water intrusion, land subsidence, flood hazard, funding and initiation of studies, cooperating agencies, publication of reports, and data, and looking ahead. The Geological Survey began its inventory of hydrologic data in southern California in November 1895 with a stream-gaging station on the San Gabriel River near Azusa. Since that time, the scope of the program has expanded to include the collection and monitoring of hydrologic information for Federal, State, and local agencies in all the major drainage basins in southern California. The program includes the measurement of streamflow, water-level changes in lakes and reservoirs, water levels in wells, and temperature, chemical quality, and sediment in streams and reservoirs. (Woodard-USGS)
W71-10713

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN MARYLAND.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W71-10732

THE WATER RESOURCES OF THE UPPER PENINSULA DRAINAGE AREA.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 06D.
W71-10739

IMPLICATIONS OF LAND AND WATER USE DEVELOPMENTS IN MICHIGAN FOR FUTURE PUBLIC WATER RESOURCE POLICY,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 06D.
W71-10740

WATER RESOURCE CONDITIONS AND USES IN THE LOWER GRAND RIVER BASIN.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 06D.
W71-10742

THE WATER RESOURCES OF THE LOWER LAKE HURON DRAINAGE BASIN.
Michigan State Water Resources Commission, Lansing. Dept. of Conservation.
For primary bibliographic entry see Field 06D.
W71-10744

HOUSEHOLD DECISION PROCESSES IN THE PURCHASE AND USE OF RESERVOIR RECREATION LAND,
North Carolina Univ., Chapel Hill. Water Resources Research Inst.
Raymond J. Burby, III.
Available from the National Technical Information Service as PB-201 749, $3.00 in paper copy, $0.95 in microfiche. Report No. 51, North Carolina Water Resources Research Institute, Raleigh, March 1971, 213p, 1 fig, 62 tab, 20 ref, 2 append. OWRR Project B-012-NC (8).

Descriptors: *Reservoir sites, *Pre-impoundment, Reservoirs, *Land use, *Land development, Decision making, North Carolina, Georgia, *Recreation, Water resources development, Impoundments.
Identifiers: *Reservoir recreation, *Lake Norman (N.C.), *Lake Sidney Lanier (Geo.).

The effectiveness of public policy in guiding the residential development of reservoir shorelands is largely dependent on a basic understanding of underlying development processes. The conversion of rural reservoir land to recreational residential use emerges over time from a set of complex decisions by reservoir owners, public officials, landowners, residential developers, and households. This study is concerned with the final stage of the land development process, the decisions of households to purchase and use shoreline land. Based on a random sample survey of 268 households who have acquired shoreline property adjacent to Lake Norman, North Carolina, and Lake Sidney Lanier, Georgia, the study describes the key components of these decisions and identifies factors which influence household behavior. While the research focuses on decisions related to the acquisition of specific shoreline sites, attention is also devoted to the extent and manner in which shoreline property is utilized by households, their satisfaction with various types of property and preferences for future shoreline sites, and household perceptions of community problems in reservoir areas. The results of this study provide a research base for efforts to forecast reservoir shoreline development patterns and supply land use planners and policy makers with needed information on this important stage in the reservoir residential development process. (See also W71-10758) (Howells-North Carolina)
W71-10757

A MODEL FOR SIMULATING RESIDENTIAL DEVELOPMENT IN RESERVOIR RECREATION AREAS,
North Carolina Univ., Chapel Hill. Water Resources Research Inst.
For primary bibliographic entry see Field 06A.
W71-10758

COMMUNITY ORGANIZATION AND RURAL WATER SYSTEM DEVELOPMENT,
Mississippi State Univ., State College. Social Sciences Research Center.
John H. Peterson, Jr.
Available from the National Technical Information Service as PB-201 729, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Mississippi Water Resources Research Institute, State College, 1971, 53 p, 7 tab, 4 maps, 19 ref. OWRR Project B-005-MISS (1).

Descriptors: *Community development, Rural areas, Water resources development, *Rural sociology, *Social aspects, Mississippi.
Identifiers: *Rural water systems.

Rural comminities in a representative county were studied to determine the range of community experiences in water system development and to establish the relationship between community organization and water system development. A positive, statistically significant, relationship was found between level of community organization and effectiveness in water system development. All communities involved in organizing water systems for single communities had a high level of community organization. Communities with a low level of community organization could effectively participate in the organization of a multi-community water system if they were associated with a more highly organized community in the developmental effort. An extension of the study beyond the representative county indicated a tendency for earlier organized water systems to serve individual communities, but for later organized water systems to serve multiple rural communities. Level of community organization was an important factor in rural water system development. Where a low level of community organization existed, development could be enhanced by linking highly organized communities with less organized communities in developing water systems for a larger area.
W71-10759

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA,
Denver Regional Council of Governments, Colo.
Wayland Walker.
Available from the National Technical Information Service as PB-198 100, $3.00 in paper copy, $0.95 in microfiche. Denver Regional Council report, April 1971. 159 p. HUD Colo P-91.

Descriptors: *Water quality control, *Planning, *Sewage treatment, *Urbanization, Regional analysis, Water pollution, Industrial wastes, Agricultural wastes, Runoff, Storm runoff, Erosion, Mine wastes, Colorado, Mine drainage.
Identifiers: *Colorado, Surface water runoff, Storm sewers, Mine waters, Forecasting, *Denver, Colorado, South Platte River Basin, Mine acid drainage, *Boulder (Colo).

The purpose of the Interim Plan is to identify immediate needs and begin the development of a long range program of sewerage facilities construction and water quality management. The geographical scope of the report includes the Denver SMSA portion of the South Platte River Basin. Information from the major water quality management agencies, both regulatory and operational, is presented in the study. Waste discharge information is shown for municipal, industrial, agricultural and storm water effluent. Sampling stations and Colorado water quality standards are listed as well as problem areas and outfall locations. The needed and projected short-

range improvements are documented for the regional study area. An outline of a proposed fully developed master plan, yet to be done, is presented in the final chapter.
W71-10772

TEXOMA REGION AREAWIDE WATER PLAN. PHASE I. FUTURE WATER REQUIREMENTS, EXISTING WATER SUPPLY SYSTEMS AND AVAILABLE WATER RESOURCES.
Texoma Regional Planning Commission, Tex.

Available from the National Technical Information Service as PB-198 101, $3.00 in paper copy, $0.95 in microfiche. Texoma Regional Planning report 1971. 185 p. HUD Project Texas P-285.

Descriptors: *Planning, Regional analysis, *Urbanization, *Water supply, *Water requirements, Groundwater, Water consumption, Water rights, Surface waters.
Identifiers: Urban areas, Water pipes, *Texoma Region (Texas).

The Texoma Region Areawide Water Plan is a planning effort to ascertain the best method of developing surface water and groundwater resources for the major urban centers in Cooke, Grayson and Fannin Counties, Texas.
W71-10780

SUMMARY REPORT OF PLANS AND PROGRAMS FOR THE DEVELOPMENT OF WATER SUPPLY AND SEWAGE DISPOSAL FACILITIES IN THE LOWER PIONEER VALLEY.
Lower Pioneer Valley Regional Planning Commission, West Springfield, Mass.

Available from the National Technical Information Service as PB-198 210, $3.00 in paper copy, $0.95 in microfiche. Planning report, March 1970.

Descriptors: *Water supply, *Sewage disposal, *Planning, *Regional analysis, Costs.
Identifiers: Regional planning, Massachusetts, Hampden County (Mass), Hampshire County (Mass).

The aim is to formulate areawide plans and programs for water supply and sewage disposal facilities that are consistent with the areawide comprehensive plans, capable of meeting future needs up to the year 2020, and acceptable in terms of HUD's certification process. A conceptual systems framework is developed such that subsequent engineering and planning activity can proceed with an assurance of compatibility with areawide comprehensive planning considerations.
W71-10783

SEWAGE DISPOSAL FACILITIES.
Lower Pioneer Valley Regional Planning Commission, West Springfield, Mass.
For primary bibliographic entry see Field 05E.
W71-10784

PUBLIC PERCEPTIONS OF WATER QUALITY,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 05G.
W71-10869

AN AGGREGATIVE MODEL FOR MUNICIPAL ECONOMIC PLANNING,
Virginia Polytechnic Inst., Blacksburg. Coll. of Business.
Sang M. Lee, and William R. Sevebeck.
Policy Sciences, Vol. 2, No. 2, p 99-115, June 1971. 17 p, 5 tab, 15 ref.

Descriptors: *Economic efficiency, *Methodology, *Model studies, *Planning, Simulation analysis, Linear programming.
Identifiers: *Goal programming.

A methodology is presented for the effective long-range economic planning of a municipal government by applying the goal programming (GP) model to design an optimum aggregative model for municipal economic planning. This model was developed with the town of Blacksburg as an illustration. The GP approach required administration to identify, establish critical interrelationships, and define the relative importance of various objectives. The structure thus derived represented a given policy or set of policies. GP modeling helped identify where some incompatability existed among goals under a given policy and where the policy must be reviewed and modified in view of the most desirable objectives. The simulation capability of the GP model provided the following four advantages: (1) time was saved in planning economic activities of the municipal government; (2) the results of the model might be used for further planning, realignment of goals, and re-evaluation of constraints; (3) if the upper limit of credit was not used, the information derived from the model could be useful in planning for additional external financing; and (4) this approach to economic planning stressed the organized and integrated understanding of objectives, the interrelationships among variables in the system, and a careful consideration of alternatives and constraints, thus leading to long-range effectiveness in planning, operations, and control. (Veverka-Cornell)
W71-10871

FOURTH DIMENSION FOR URBAN ENVIRONMENT,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 05G.
W71-10883

A PROGRAM FOR NEW TOWNS,
Urban Associates of Chicago, Ill.
Ira J. Bach.
Proceedings, American Society of Civil Engineers, Journal of the Urban Planning and Development Division, Vol 97, No UP1, p 55-62, April 1971, 1 ref.

Descriptors: *City planning, *Urbanization, *Community, Cities, Planning.
Identifiers: *New towns, *Regional planning.

Regional planning, involving programs of new town development, offers solutions to some of the problems attendant upon the growth of megalopolis and may provide a key to the solution of others. The concentrated development of the major urban regions of the United States has resulted in severe dislocations, due in large measure to a lack of regional planning. The experience of both western and eastern Europe indicates that part of the answer may lie in the establishment of new towns to serve one or more of these purposes: To provide better organized, more effectively controlled suburban development; to accommodate over-spill or aid slum clearance; to serve as growth centers for national or regional plan purposes. The new towns concept has enjoyed a limited history in the United States, although it has met with some success where employed. The principles of the Radburn Idea, first promulgated in the 1920's, are equally valid today. (Davis-Chicago)
W71-10884

ECONOMIC FACTORS IN WATER POLLUTION CONTROL: PART II,
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W71-10890

IDEAS AND ATTITUDES: A SCENERY CLASSIFICATION SYSTEM,
Vermont Univ., Burlington. Dept. of Agricultural Economics.
Frederic O. Sargent.
Journal of Soil and Water Conservation, Vol 21, No 1, p 26-27, January-February 1966, 1 chart.

Descriptors: *Scenery, *Planning, *Natural resources, *Recreation, Landscaping.
Identifiers: *Scenery classification system, Regional development, Scenic resources.

Regional development programs are beginning to consider scenery as a basic natural resource. This article represents a suggested system for scenery classification, which is not proven and has only been field tested once. Classification of scenery provides a basis for comparison of scenic resources within a planning region. The system presented in this article is designed to be used in coordination with classification of forest, agriculture, wildlife, and recreation lands in the process of conducting a regional resource base inventory. (Strachan-Chicago)
W71-10892

A REGIONAL SEWERAGE PLAN FOR THE WILAMETTE VALLEY,
Barrett and Associates.
For primary bibliographic entry see Field 05G.
W71-10895

MANAGING NATURAL RESOURCES THROUGH LAND TENURE STRUCTURES,
Iowa State Univ., Ames.
John F. Timmons, and J. M. Cormack.
Journal of Soil and Water Conservation, Vol 24, No 1, p 4-10, January-February 1971, 3 photo, 7 ref.

Descriptors: *Land tenure, *Natural resources, *Management, Land resources, Exploitation.
Identifiers: *Natural resource use, Land tenure responsibility.

The relationship is explored between land tenure and natural resource use and the options open to make land tenure structures more responsive to improved use and management of natural resources. Land tenure is both the cause and solution of the problem of exploitation of natural resources. Land tenure structures during the pioneer days developed in a laissez faire manner without regard to exploitation of natural resources. Land tenure structures must be examined and redesigned to prevent uncontrolled exploitation of the natural resources. All the changes involved in land tenure restructuring should emphasize land tenure responsibilities as well as land resource use. Resource Development and Environmental Control Districts are proposed which would develop rules for using each land resource. These rules would make the essence of the Trusteeship in Land with its rights, duties, and responsibilities. The authors recommend further consideration of the district and trusteeship concepts. (Strachan-Chicago)
W71-10896

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE EFFECT OF PRICE ON LONG RUN WATER SUPPLY BENEFITS AND COSTS,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06B.
W71-10513

OIL POLLUTION LIABILITY AND FINANCIAL RESPONSIBILITY. A REPORT TO THE PRESIDENT AND THE CONGRESS.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-10672

AMORTIZATION OF POLLUTION CONTROL FACILITIES: HOW THE NEW ELECTION WORKS,
For primary bibliographic entry see Field 06E.
W71-10679

COSTS FOR EQUIVALENT UPSTREAM REDUCTION IN WASTE WATER DISCHARGES,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
W71-10860

MULTISTAGE MARGINAL COST MODEL OF INVESTMENT-PRICING DECISIONS: APPLICATION TO URBAN WATER SUPPLY TREATMENT FACILITIES,
Cornell Univ., Ithaca. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 05F.
W71-10861

ECONOMIC INCENTIVES FOR POLLUTION ABATEMENT: APPLYING THEORY TO PRACTICE,
For primary bibliographic entry see Field 05G.
W71-10967

6D. Water Demand

A GEOGRAPHICAL SYSTEMS ANALYSIS OF THE WATER SUPPLY NETWORKS OF THE NEW YORK METROPOLITAN REGION,
Columbia Univ., New York. Dept. of Geography.
Michael R. Greenberg, George W. Carey, Leonard Zobler, and Robert M. Hordon.
The Geographical Review, Vol 61, No 3, p 339-354, June 1971. 4 fig, 4 tab, 16 ref, 1 append.

Descriptors: *Water supply, *Networks, *Systems analysis, *Mathematical models, *Resource allocation, Urbanization, Cities, Planning.
Identifiers: *Geographical network redesign, *Projected demands, *Operational efficiency, *Inefficient state, New York metropolitan region, Water agencies, Water allocation.

The rising costs of increasing the water supply make it necessary to consider means for economizing urban water use. A search for new and revised methods of fulfilling projected demands for water has begun. This paper focuses on one fundamental alternative, geographical network redesign. The hypothesis of the paper is that water shortages in urban regions may be caused in part by inefficient distribution of the available water supply. If the shortage of water is caused by the inefficiency of its distribution, then the location of new sources of water supply is not the most important focus of interest. The present urban network existing in the New York Metropolitan Region, which the paper uses as a test case, results in shortages of water in one part of the region while surplus water is immobilized elsewhere, resulting in an inefficient state. Links between agencies in the New York Metropolitan Region have been made largely on an ad hoc basis without regard for the effect on other agencies and distributions. By developing and using mathematical models the paper seeks to locate these inefficiencies in time, place, and quantity, and to recommend changes and redistributions in network design and flows that can satisfy all projected demands. The article contends that water allocation ought to be undertaken with the view of conserving water first and dollars second. (Strachan-Chicago)
W71-10519

USE DESIGNATION AREAS FOR MICHIGAN'S INTRASTATE WATER QUALITY STANDARDS.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.

Water Resources Council Grant, March 1969. 48 p, 25 ref.

Descriptors: *Water quality control, *Water utilization, *Planning, *Michigan, Water pollution control, Industrial use (Water), Municipal water, Agriculture, Intrastate rivers, Nutrients, Recreation, Water supply.
Identifiers: *Michigan Intrastate Water Quality Standards, *Intrastate waters.

The Intrastate Water Quality Standards of Michigan that were adopted January 4, 1968 are summarized. The designated uses and the plan of implementation for all of Michigan's intrastate waters are discussed in detail. A series of five water and related land resource inventory reports were compiled by the Commission staff and used in specifying use designations. The specific uses that were designated for protection include: domestic water supply; industrial water supply; recreation; fish, wildlife and other aquatic life; agriculture; and commercial, navigation and other uses. Of the gross area of 61,946,160 acreas, 24,688,000 acres of Michigan's territory is Great Lakes surface, while 841,000 acres are covered with inland lakes and ponds. The state has 3,121 miles of Great Lake shoreline, 36,350 miles of inland streams and over 25,000 mapped lakes and ponds which cover areas of more than a tenth of an acre. The Water Resources Commission of Michigan acts under the authority of the Federal Water Quality Act of 1965, and its own basic law, Act 245, P.A. 1929, as amended (included in the appendix). Previously, on June 28, 1967, the Water Resources Commission adopted water quality standards for Michigan's 'interstate' waters together with a plan for implementation and enforcement. At the same time the Commission designated specific water uses to be protected by these standards in particular sectors of 'interstate' lakes and streams, based on present and prospective future use of the resource. (Poertner)
W71-10738

THE WATER RESOURCES OF THE UPPER PENINSULA DRAINAGE AREA.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.

Water Resources Council Grant, October, 1968. 164 p, 21 fig, 41 tab, 67 ref. PL 23.

Descriptors: *Water resources, *Michigan, *Planning, *Watersheds (Basins), Water quality, Water utilization, Water supply, Groundwater, River flow, Soil classifications, Agriculture, Industrial water, Recreation, Administration, Regional analysis, Geology, Climatology, Irrigation, Flood control, Drainage practices, Employment opportunities, Waste water disposal.
Identifiers: *Upper Peninsula Drainage area.

The following are presented: a comprehensive view of the existing water uses in Michigan's Upper Peninsula Drainage Area, a summary of recent trends in regional water uses, and anticipated future uses. This information will be employed immediately in the formulation and adoption by the Michigan Water Resources Commission of designated uses for the natural and artificial waters of the Upper Peninsula Drainage Area. The designated uses will later be protected by established water quality standards. Isolated from the population centers of the Midwest, the area's vast waters and wildlands offer unexcelled and abundant opportunities for outdoor enjoyment. Economically however, the Upper Peninsula's story is much less bright. Beset with population contraction, economic stagnation, and wide spread under-employment and unemployment, the Upper Peninsula's major problems are quite different from the contemporary social and resource concerns facing the more urbanized sections of Michigan. Two avenues of economic opportunity hold promise for the Upper Peninsula -- expansion of resource-based industries and growth of tourism and outdoor recreation activities. It is necessary to secure a more comprehensive understanding of the character, magnitude, and potential of the natural resources of the area. This report was designed to further the achievement of such an understanding. (Poertner)
W71-10739

IMPLICATIONS OF LAND AND WATER USE DEVELOPMENTS IN MICHIGAN FOR FUTURE PUBLIC WATER RESOURCE POLICY,
Michigan State Univ., East Lansing. Dept. of Resource Development.
Raleigh Barlowe.
HUD Grant. Michigan Water Resources Commission, Lansing, Report WRC-PL. 8, (1966). 56 p, 5 tab.

Descriptors: *Water demand, *Planning, *Land use, *Water utilization, *Water resources, Water supply, Agriculture, Recreation, Urbanization, Forecasting, Great Lakes, Michigan, Commercial fishing, Water policy, Water quality, Water costs, Forest management.
Identifiers: Population trends.

Recent land and water use trends in the State are appraised along with their implications for the future. Emphasis was given to: (1) a description of the present land and water resource use situation in Michigan; (2) a projection of present trends to provide a measure of future needs; and (3) a discussion of the implications of these trends for future water resources policy. The problems of more people and rising per capita demands for water will give rise to new problems involving the quantities and quality of the waters available for public and private use. New supplies will be tapped and the state may someday be criss-crossed with watermains that connect all cities with the Great Lakes. Much of the emphasis in the public policy will be on maintenance and enhancement of water quality. Water supplies will be augmented; quality control measures will be employed; and water will be made available to more people and at more locations. These programs will involve higher costs and more controls but an enlightened public will pay the extra costs and accept controls if they understand the overall problem. (Poertner)
W71-10740

WATER RESOURCE CONDITIONS AND USES IN THE LOWER GRAND RIVER BASIN.
Michigan State Water Resources Commission, Lansing. Dept. of Natural Resources.

1968. 133 p, 22 fig, 35 tab, 9 ref.

Descriptors: *Planning, *Watersheds (Basins), *Michigan, *Water quality, *Water utilization, Water resources, Agriculture, Water supply, Industrial water, Municipal water, Municipal wastes, Recreation, Administration, Waste water (Pollution), Geology, Climatology, Irrigation, Flood control, River flow, Drainage practices.
Identifiers: *Grand River Basin.

A survey was designed and conducted to provide guidance for planning groups that require a sound and broad understanding of the water resources of the Lower Grand River Basin. With the exception of Grand Rapids, they have so far been adequate to meet the supply needs of farm, home, and business. However, with respect to waste a assimilation, streamflow is recurrently inadequate for even the modest uses presently being made and, in its unregulated condition, offers little potential for municipal-industrial expansion. Potentialities for expanded water use are distinctly promising in most categories. Groundwater sources appear capable of extensive development, and excellent sites have been found where reservoirs could be established both for low streamflow improvement and for stable-level water recreation areas. Realization of the possible water-use benefits in this area is contingent upon the application of coordinated management effort, particularly with respect to surface water. Groundwater development will entail mainly evaluative and pollution prevention effort. But surface water development will call first for reserving the flow-augmentation and recreation area reservoir sites followed by programmed building and operating of the necessary dams. Recommendations are made urging that inter-interest watershed organizations continue to: effectuate careful planning, secure assistance, serve as a clearinghouse for water

resources issues, and insure the timely activation or creation of proper action agencies. (Poertner)
W71-10742

MICHIGAN'S WATER RESOURCE NEEDS,
Michigan State Univ., East Lansing.
Raleigh Barlowe, Michael McGuire, and Robert Vertrees.
Water Resources Council Grant. State of Michigan, Water Resources Commission, Department of Natural Resources, Lansing, Pl. 27, June 1969. 52 p, 1 fig, 12 tab. Pl. 27.

Descriptors: *Water demand, *Planning, *Water supply, *Water quality control, *Michigan, Industrial water, Industrial production, Forecasting, Agriculture, Recreation, Municipal water, Navigation, Waste water treatment, Water utilization, Water users.
Identifiers: Water quality standards.

The report focuses attention on two important aspects of public water resources planning in Michigan: (1) future water resource needs, and (2) the probable impact of water quality regulations on future industrial developments. Careful consideration was given in this study to the projection of water resource needs in Michigan to the years 1980 and 2000. For analysis purposes, water uses in the State were classified into four major groupings: household and commercial; industrial; agricultural; and recreation, navigation, and other. Projections were made for seven subregional watershed areas. Acceptance and enforcement of water quality standards can provide a boon to many water using industries. Recreation-oriented industries in particular are attracted to and frequently require large bodies of water for scenery and play. Many other industries also find the prospect of adequate supplies of good clean water a basic necessity. Insofar as enforcement of water quality standards makes it possible for communities to provide the water supplies needed by industries in the quantities and quality demanded, good enforcement can facilitate industrial development and economic growth throughout the state. (Poertner)
W71-10743

THE WATER RESOURCES OF THE LOWER LAKE HURON DRAINAGE BASIN.
Michigan State Water Resources Commission, Lansing. Dept. of Conservation.

Water Resources Council Grant. State of Michigan, Water Resources Commission, Department of Conservation, Lansing, PL. 18, May 1968. 189 p, 27 fig, 45 tab, 61 ref. PL. 18.

Descriptors: *Water resources, *Michigan, *Planning, *Watersheds (Basins), Water quality, Water utilization, Water supply, Groundwater, River flow, Soil classifications, Agriculture, Industrial water, Recreation, Administration, Regional analysis, Geology, Climatology, Irrigation, Flood control, Drainage practices, Employment opportunities, Waste water disposal, Lake Huron.
Identifiers: *Lake Huron Drainage Basin.

The following are presented: a comprehensive view of the existing water uses on the Lower Lake Huron Drainage Basin, a summary of recent trends in regional water uses, and anticipated trends and future uses. A few small areas in this 9,730 square mile region hold most of the more than 1,100,000 persons living in the region. These heavily populated areas are also highly industrialized giving rise to concentrations of water use. The intensive farming carried on in the region also contributes substantially to total water use. The amount of additional water necessary to support the predicted growth of the population and the economy in the closing decades of this century is considerable. The magnitude of the resource, the vast quantities available from the Great Lakes, the local rivers and inland lakes, and the groundwater resources will be adequate to meet this demand if diligent efforts are made to plan and manage the water resources for maximum multi-purpose beneficial use. During the coming decade and beyond, it is probable that the Lower Lake Huron Drainage Basin will experience increases in water use from additional population, higher per capita use rates, and industrial growth and development. Lake Huron itself will become the new source of supply for two of the three largest metropolitan areas in the state. (Poertner)
W71-10744

TEXOMA REGION AREAWIDE WATER PLAN. PHASE I. FUTURE WATER REQUIREMENTS, EXISTING WATER SUPPLY SYSTEMS AND AVAILABLE WATER RESOURCES.
Texoma Regional Planning Commission, Tex.
For primary bibliographic entry see Field 06B.
W71-10780

ASSESSMENT ANALYSIS FOR WATER SUPPLY ALTERNATIVES,
Corps of Engineers, Alexandria, Va. Inst. of Water Resources; and Colorado State Univ., Fort Collins; and Washington State Univ., Pullman.
For primary bibliographic entry see Field 06A.
W71-10858

AN ALGORITHM FOR IRRIGATION PROJECT PLANNING,
Harvard Univ., Cambridge, Mass. Centre for Population Studies.
For primary bibliographic entry see Field 03F.
W71-10875

6E. Water Law and Institutions

GOVERNMENTAL RESPONSIBILITIES FOR THE APPLICATION AND CONTROL OF TECHNOLOGY IN RELATION TO MAN'S ENVIRONMENT,
Organization for Economic Co-Operation and Development, Paris (France).

Paper, Organization for Economic Cooperation and Development Secretarist, Paris, France, July 1970, 37 p.

Descriptors: *Institutional constraints, Planning, Air pollution, Noise pollution, *Environment, *Water pollution, *Social aspects, Decision making, Pesticides, Eutrophication, Administration.
Identifiers: *Governmental responsibilities, *Environmental policy, Public policy, Resource policy, Comprehensive planning.

Government responsibilities in relation to man's environment are discussed and related to the general policy implications arising from the Organization for Economic Cooperation and Development's studies in the public domain, notably on the eutrophication of lakes and rivers, the problem of sulfur in the atmosphere, the unintended occurrence of pesticides, urban traffic noise, and the sonic boom. Possible conflicts may arise between desired and necessary technological innovation and development, and the undesired effects on man's environment. Policy makers should have a role in assessing new technology before and after it is introduced into use. In order to improve environmental quality, governmental structures and evaluation systems are needed for dealing with competing interests and values involved in environmental control. International cooperation is necessary for comparing national environmental policies, sharing information, and controlling world-wide environmental problems. (Wray-Chicago)
W71-10509

WHO SHOULD MAKE LOCAL WATER MANAGEMENT POLICIES,
National Association of Counties.
Mel D. Powell.
American County, Vol 36, No 5, p 16-21, April 1971. 7 photo.

Descriptors: *Water policy, *Water resource development, *Institutional constraints, City planning, Planning, Institutions, Decision making.
Identifiers: *Policy making, *Water management strategies, *Water management institutions, *Water resources planning, Planning process, Policy implementation.

This article surveys Present institutional and administrative constraints on metropolitan water resources planning are surveyed and present water resources planning processes are analyzed. Important questions discussed include who manages water resources, who establishes the relevant policies, and how the policies are implemented through the planning process. The author concludes that management of water resources requires interfacing between policy makers and water management institutions - a range including local and federal agencies. He further concludes that water management in the future will have to take into account the policy decisions of urban communities in order to be effective. Such strategies will be sensitive to engineering requirements but will integrate them with the policy making role of the selected officials. (Strachan-Chicago)
W71-10520

MAINTAINING WATER QUALITY,
National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 05C.
W71-10550

WATER POLLUTION: DEPOSITS OF SUBSTANCES DELETERIOUS TO FISH.

Nevada Revised Statutes sec 503.430 (1961).

Descriptors: *Nevada, *Pollution abatement, *Fish conservation, *Pollutant identification, Legislation, Legal aspects, Chemical wastes, Domestic wastes, Industrial wastes, Mine wastes, Sewage, Pulp wastes, Solid wastes, Wood wastes, Waste disposal, Waste identification, Water pollution sources.

Any person who pollutes the waters of the state with lime, gas tar, cocculus indicus, slag, acids or other chemicals, sawdust, shavings, slabs, edgings, mill or factory refuse, sewage, garbage, or any substance deleterious to fish shall be guilty of a misdemeanor. (Gallagher-Florida)
W71-10562

POISONING OF WATERCOURSES.
Utah Code Ann sec 76-42-6 (1953).

Descriptors: *Utah, *Legal aspects, *Poisons, *Public health, Legislation, Toxins, State governments, Public benefits, Social aspects, Reservoirs, Reservoir storage, Springs, Spring waters, Streams, Wells, Regulation.

Every person who willfully poisons any spring, well, stream or reservoir of water is punishable by imprisonment in the state prison for a term not less than one nor more than ten years. (Robinson-Florida)
W71-10570

DURNING V ITT RAYONIER INC (QUI TAM ACTION UNDER REFUSE ACT).
325 F Supp 446-447 (WD Wash 1970).

Descriptors: *United States, *Rivers and Harbors Act, *Water pollution control, *Adjudication procedure, Navigable waters, Water pollution, Water pollution sources, Ships, Pollution abatement, Federal government, Judicial decisions, Legal aspects, Legislation, Waste disposal,

Harbors, Coordination, Federal jurisdiction, Relative rights.
Identifiers: *Refuse Act, *Qui tam.

Plaintiff informant brought a civil action and sought to recover one-half of a fine prescribed in the Rivers and Harbors Act for defendant corporation's alleged deposit of refuse into navigable waters. Contending that plaintiff had no standing to sue, the defendant moved for an order dismissing plaintiff's complaint. Plaintiff contended that section 411 of the Act implies that a civil action by the informant is permissible where the informant seeks to recover his bounty. The United States District Court for the Western District of Washington held that Congress in enacting this criminal statute intended to reward an informant for information leading to the conviction of a wrongdoer, and did not intend to provide a means by which an informant may initiate civil proceeding to recover the amount he might receive after a criminal conviction. Noting that if plaintiff's contention was correct the court would be in the awkward position of determining priority between a criminal prosecution by the United States and a civil action by an informant, the court granted defendant's motion to dismiss. (Shelnut-Florida)
W71-10582

UNITED STATES V BARGE BOULDER.

238 Fed Supp 748-750 (WD La 1964).

Descriptors: *Oil, *Leakage, *Ships, *Pollution abatement, Judicial decisions, Legislation, Water pollution sources, Water pollution, Water pollution control, Oil wastes, Legal aspects, Transportation, Inland waterways, Inspection, Regulation, Seaworthiness, Coast guard regulations, Accidents.
Identifiers: *Oil Pollution Act of 1924.

Defendant barge was used in transporting crude oil and on one occasion discharged crude oil into locks of the Gulf Intracoastal Waterway. Defendant had been inspected before and after loading of the crude oil by the dock operator, who found it to be undisputedly tight, seaworthy and without leaks. In addition, defendant had been certified as having satisfactorily undergone the inspections required by law and Coast Guard regulations and had no prior histroy of leakage. Upon subsequent inspection, experts examined the subsurface leak and indicated that it could only have been caused by striking a submerged object. The United States brought this action under the Oil Pollution Act of 1924, which prohibits discharge of oil into navigable waters unless through an unavoidable accident. On motion for rehearing the United States District Court reaffirmed its classification of the discharge as an unavoidable accident since defendant was a tight ship, duly inspected and loaded without any previous reason to expect that oil would be discharged from her. It was found that the oil leaked out unavoidably from some accidental or unknown cause. (Gallagher-Florida)
W71-10610

UNITED STATES V SS MORMACSAGA (VESSEL'S LIABILITY FOR REFUSE DISCHARGE IN NAVIGABLE WATERS).

204 F Supp 701-702 (ED Pa 1962).

Descriptors: *United States, *Rivers and Harbors Act, *Water pollution sources, *Ships, Navigable waters, Water pollution, Waste disposal, Pollution abatement, Federal government, Judicial decisions, Legal aspects, Legislation, Delaware River, Water pollution control, Harbors, Admiralty, Adjudication procedure, Federal jurisdiction.
Identifiers: *Refuse Act.

Plantiff United States brought a libel in rem to recover statutory penalties against defendant ship, under the Rivers and Harbors Act, for the unlawful discharge of refuse in navigable waters. Defendant ship had discharged refuse into navigable waters on three occasions separated by time intervals and at three different geographic points. While defendant conceded a violation, the shipowner contended that there was only one violation. The plaintiff contended, however, that there were three separate acts constituting three violations. The United States District Court for the Eastern District of Pennsylvania held that since the offense is one of strict liability the facts supported a finding that the Act was violated on three separate occasions. Judgment was entered in favor of plaintiff and against defendant in the sum of one thousand five hundred dollars, and costs. (Shelnut-Florida)
W71-10621

INSTITUTIONAL PATTERS IN EVOLVING REGIONAL PROGRAMS FOR WATER RESOURCE MANAGEMENT,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W71-10642

REGIONAL CONTROL OF AIR AND WATER POLLUTION IN THE SAN FRANCISCO BAY AREA,
For primary bibliographic entry see Field 05G.
W71-10676

AGRICULTURE AND THE POLLUTION PROBLEM,
For primary bibliographic entry see Field 05G.
W71-10678

AMORTIZATION OF POLLUTION CONTROL FACILITIES: HOW THE NEW ELECTION WORKS,
John W. McNulty.
Journal of Taxation, Vol 34, No 4, p 211-214, 1971, 4 p, 25 ref.

Descriptors: *Taxes, *Amortization, *Pollution abatement, *Legal aspects, Depreciation, Federal government, Governments, Legislation, Government finance, Air pollution, Water pollution control, Waste treatment, Water pollution, Standards, State governments, State jurisdiction, Social aspects, Water pollution treatment.

Amortization of pollution control facilities under section 169 of the Internal Revenue Code is considered, with attention given to the specific limitations contained in the section. An election to take the amortization deduction is made by so informing the Service and is subject to various limitations. The election may be discontinued at any time and depreciation thereafter taken, but once the election is terminated the taxpayer cannot reelect and resume the amortization deduction with respect to that facility. The deduction is available only with respect to certified pollution control facilities used in connection with a plant or other property in operation before 1969 to abate or control water or atmospheric pollution. The facility must be certified by the state certifying authority having jurisdiction and by the federal certifying authority. Special attention is given statutory limitations designed to prevent any windfall to taxpayers from profits derived from the facilities. The amortizable basis is next considered, with attention given to the four major modifications used in determining the basis. Miscellaneous features and planning considerations are also considered. (Horwitz-Florida)
W71-10679

OHIO RIVER SAND CO V COMMONWEALTH.
467 SW2d 347-350 (Ky 1971).

Descriptors: *Kentucky, *Water pollution sources, *Pollution abatement, *Industrial wastes, Air pollution, Water pollution control, Water pollution, Waste disposal, Wastes, Waste dumps, Dusts, Pollutants, Abatement, Public rights, Legislation, Relative rights, Streams, Remedies, Damages, Judicial decisions, State governments, Legal aspects.

Defendant corporation was charged through private complaint with maintaining a public nuisance by polluting the atmosphere, streams, and waters with dust, refuse, and waste. Defendant contended that a statute prohibiting pollution abrogated the common-law offense of public nuisance. Defendant also contended that its operations were normal and did not produce pollutants in greater quantity than other similar operations, and that the private parties complaining should not be permitted to maintain a nuisance action when they moved to the site of the nuisance after it was already in existence. In sustaining a trial court conviction of defendant, the Court of Appeals of Kentucky noted that the intent of the pollution statute was to supplement, not abrogate, the common-law remedies. Although corporate operations may be normal in not producing pollutants in greater quantity than other similar operations, such actions are not excused nor rendered non-criminal therefor. The court further held that a purchaser of property affected by an existing nuisance is not estopped to complain of it, though the circumstance may be considered as a factor in determining the equities of the case. (Smilijanich-Florida)
W71-10680

SHELL OIL CO V AINSWORTH (EVIDENCE INSUFFICIENT TO LINK WATER POLLUTION WITH OIL WELL).
247 So 2d 815-817 (Miss 1971).

Descriptors: *Mississippi, *Water pollution, *Pollutant, Identification, *Oil wastes, Pollutants, Water quality, Impaired water quality, Path of pollutants, Pollution abatement, Soil contamination effects, Ponds, Wastes, Fishkill, Legal aspects, Water law, Judicial decisions, Oil wells, Remedies, Adjudication procedure.

Plaintiff landowner sued defendant oil company for damages to a pond and killing of fish on plaintiff's property, which he alleged to be the result of the discharge of a foreign substance from defendant's nearby oil well. Plaintiff's evidence included analysis of water from the pond showing it to be very alkaline. Experts testified that such alkalinity would require the presence of a foreign substance and would kill fish. The Supreme Court of Mississippi reversed a judgment for plaintiff and held such circumstantial evidence not to sustain a judgment for plaintiff. The court stated that plaintiff had failed to identify the foreign substance and to show that defendant was responsible for its presence in the pond. (Madsen-Florida)
W71-10681

EMERGENCY ACTIONS (WATER POLLUTION CONTROL PROCEDURES).
Georgia Water Quality Control Board, Atlanta.

Ch 730-5, Rules of the Board, (1964). 1 p.

Descriptors: *Georgia, *Water quality control, *Water pollution control, *Administrative procedures, Pollution abatement, Water pollution, Abatement, Water quality, Streams, Legal aspects, Water law, Legislation, Administrative agencies, Adoption of practices, Regulation, Water policy, Pollutant identification, Planning.

The purpose of this statute is to provide procedures for the handling of any emergency endangering Georgia's waters. The Executive Secretary, Chairman, and Vice Chairman of the State Water Quality Control Board are authorized to issue emergency orders when in their judgment such action is required. When a deleterious substance is discharged or in danger of being discharged into state waters, the person having control of such substance must notify the Division of Water Quality Control of the danger and take immediate corrective action. (Madsen-Florida)

W71-10682

WATER POLLUTION CONTROL.
South Dakota Compiled Laws 1967 secs 46-25-1 thru 46-25-17 as amended (Supp 1970).

Descriptors: *South Dakota, *Administrative agencies, *Water pollution control, *Standards, Regulation, Permits, Pollution abatement, Inspection, Water policy, Waste water treatment, Water pollution, Water quality, Water quality control, Waste treatment, Legal aspects, Adoption of practices, Legislation, State governments, Supervisory control (Power), Administrative decisions.

The Committee on Water Pollution is hereby established and given control over state water pollution regulation. The Committee shall classify the public waters of the state into two classes. Class A waters shall be those waters, or parts thereof, in which pollution can be controlled so that the receiving waters shall not be: (1) unwholesome or unfit for domestic use, (2) unsafe as a source of public water supply, or (3) deleterious to fish or plant life. Class B waters shall be those waters which are more important to state welfare as carriers of waste. However, wastes within Class B waters are not to be detrimental to the public health and, furthermore, no interstate or navigable waters are to be placed within Class B. The Committee is instructed to set standards for water quality, issue permits controlling pollution, and investigate alleged pollution. Violations of the statute are made misdemeanors punishable by fine and imprisonment. The Committee is authorized to seek injunctions to abate water pollution in violation of regulation or statute. The placing of deleterious substances in rivers, streams, lakes, or the banks thereof is hereby prohibited. Hearing and appeal procedures are also set forth. (Horwitz-Florida)
W71-10685

MUNICIPAL POWERS--WATER POLLUTION AND WASTE DISPOSAL AND WATER SUPPLY SYSTEMS.
South Dakota Compiled Laws, 1967, secs 9-32-8 thru 9-32-10, 9-50-1 thru 9-50-5 (1969).

Descriptors: *South Dakota, *Water supply, *Municipal water, *Water pollution control, Waste disposal, Environmental sanitation, Lefislation, State governments, Local governments, Water law, Legal aspects, Construction, Planning, Wastes, Water works, Water pollution, Water utilization, Government finance, Political aspects, Waste treatment, Treatment facilities, Adoption of practices, Water districts, Water pollution control, Supervisory control (Power), Contracts.

Every municipality shall have power to: (1) prevent the pollution of or injury to any water supply within or within one mile of municipal limits; (2) regulate the construction, repair and use of vaults, cisterns, areas, hydrants, pumps, sewers, and gutters; and (3) regulate and prevent the placing of ashes, dirt, garbage, or any offensive matter in any body or stream of water within the municipality. Every city or town shall have the power to acquire and operate any waste disposal or water supply system. Each municipality may agree or contract with another municipality or governmental agency to cooperate in the acquisition or operation of such a system. They may agree to create a commission or authority to govern the waste disposal or water supply system. Each municipality shall have the power to accept aid from commercial, industrial, or other establishments for the purpose of preventing or abating water pollution. Municipalities may accept grants or contributions or obtain loans from the federal government for the purpose of acquiring or operating waste disposal or water supply systems. (Johnson-Florida)
W71-10686

DIVISION OF SANITARY ENGINEERING (POWERS AND DUTIES OF THE PENNSYLVANIA DIVISION OF SANITARY ENGINEERING).
Pennsylvania Sanitary Water Board, Harrisburg.

Article 200, Rules and Regulations, ND. 3 p.

Descriptors: *Pennsylvania, *Administrative agencies, *Water pollution control, *Regulation, Permits, Water zoning, Abatement, Control systems, Inspection, Legal aspects, Standards, Waste treatment, Waste water (Pollution), Water pollution, Water pollution treatment, Adoption of practices, Water quality control, Supervisory power (Control), Pollution abatement, Permits, State governments, State jurisdiction.
Identifiers: Administrative regulations.

The Division of Sanitary Engineering of the Department of Health shall be the investigating, examining, reporting, and enforcing agent of the Sanitary Water Board. The scope of the Division's work shall include: (1) issuing the Board's orders, (2) studying and reporting upon permits or other applications, (3) preparing water quality standards, (4) investigating water pollution violations, (5) determining the most practical program for the protection or improvement of state waters, (6) carrying out negotiations with the responsible parties for the abatement of pollution, (7) evaluating and reporting upon methods for disposal or treatment of wastes, (8) reporting upon all other matters relating to control of water pollution, (9) enforcing orders of the Board, and (10) reporting recommendations directly to the Sanitary Water Board on all matters concerning the work of the Board. Regulations are also established concerning: (1) issuance of orders to achieve necessary corrective action, (2) extensions of time for compliance with such orders, (3) procedures for enforcement, and (4) the powers of members of the division to enter upon any lands, waters or premises for the purpose of carrying out its duties. (Horwitz-Florida)
W71-10735

THE CANADIAN ARCTIC WATERS POLLUTION PREVENTION ACT: AN ANALYSIS,
For primary bibliographic entry see Field 05G.
W71-10737

OBSTRUCTION AND POLLUTION OF WATERCOURSES--CRIMINAL OFFENSES.

Wyoming Statutes sec 35-479 (1959).

Descriptors: *Wyoming, *Water pollution, *Pollution abatement, *Obstruction to flow, Water pollution sources, Water quality control, Navigable rivers, Lakes, Ponds, Marshes, Sewers, Legislation, Regulation, Remedies, State governments, Legal aspects.

It shall be unlawful for any person to obstruct or injure any public river or stream declared navigable by law. No person shall pollute or obstruct any watercourse, lake, pond, marsh or common sewer so as to render it unwholesome or offensive to the public. Such pollution, obstruction or injury is punishable by fine and may be ordered abated as a nuisance. (Smiljanich-Florida)
W71-10770

INSTITUTIONS OF EFFECTIVE MANAGEMENT OF THE ENVIRONMENT, PART I.
National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Board.

Available from the National Technical Information Service as PB-199 180, $3.00 in paper copy, $0.95 in microfiche. Report of the Environmental Study Group, Part I, Jan 1970. 55 p.

Descriptors: *Pollution abatement, *Environmental effects, *Land use, *Recreation facilities, *Institutional constraints, Social aspects, Surveys, *Research management, Laboratories, Education.
Identifiers: *Environmental surveys, Government policies, Wildlife.

A multidisciplinary approach is provided to the nonscientific aspects of deterioration of the environment and the challenge to reverse present trends. It was determined that existing institutional arrangements are inadequate. Suggestions are made for Institute for Analytical Studies, Monitoring Agency, Environmental Quality Index, research activities in government laboratories, environmental education programs, and Federal organizations in Executive and Legislative branches. Several of the suggestions have been implemented.
W71-10802

GAS TAR, THROWING INTO PUBLIC WATER (PROHIBITION AGAINST).

Oklahoma Statutes Ann Title 21, sec 1194 (1958).

Descriptors: *Oklahoma, *Oil wastes, *Water pollution sources, *Water pollution control, Pollution abatement, Oil, Oil industry, Gasoline, Oily water, Streams, Rivers, Water pollution, Water quality, Pollutants, Wastes, Public health, Legislation, Legal aspects, Sewers, Industrial wastes.

It is a misdemeanor to throw or deposit gas tar, or refuse from any gas house or factory, into any public waters, river, or stream or into any sewer or stream that empties into any such body of water. (Rees-Florida)
W71-10805

LEASES OF STATE LANDS FOR OIL AND GAS PRODUCTION.
Texas Civil Statutes Ann art 5344, 5351, 5353, 5366 (1962).

Descriptors: *Texas, *Leases, *Oil, *Water pollution, Natural gas, Regulation, Administrative agencies, State governments, Beds, Beds under water, Rivers, Islands, Inlets, Marshes, Water pollution control, Navigation, Marine animals, Marine fish, Water pollution sources, Water pollution effects.

The Commissioner of the General Land Office may lease all islands, salt water lakes, bays, inlets, marshes, and reefs owned by Texas within tide water limits, the Gulf of Mexico within the jurisdiction of Texas, and unsold, unsurveyed public school lands for oil and natural gas production. A permit fee and an annual fee of two dollars per acre is required for a ten-year lease. Additionally, a royalty of one-eighth of the value of gross oil production and one-tenth of the value of natural gas output shall be paid. The fees of two dollars per acre, however, are not required for leases of certain submerged lands where at least five wells have been drilled. All such development in water or on islands, river beds and channels, shall be done to prevent water pollution, destruction of marine life, or obstruction of navigation. The Commissioner may adopt regulations to that end and may request enforcement assistance from the Game, Fish, and Oyster Commissioner. All regulations must be approved by the attorney general. Permits and leases may be cancelled for violation of such regulations. (Hart-Florida)
W71-10851

WATER AND WASTEWATER MANAGEMENT IN NEW YORK CITY,
Department of Water Resources, New York.
For primary bibliographic entry see Field 05G.
W71-10894

A COMPARATIVE STUDY OF STATE WATER POLLUTION CONTROL LAWS AND PROGRAMS,
North Carolina Univ., Raleigh. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W71-10901

JUDICIAL PROTECTION OF WATER RESOURCES: PRIVATE ACTION, THE PUBLIC TRUST DOCTRINE AND ADMINISTRATIVE REVIEW,
For primary bibliographic entry see Field 05G.
W71-10902

WATER POLLUTION IN IDAHO,
For primary bibliographic entry see Field 05G.
W71-10903

LIABILITY FOR POLLUTION OF SURFACE AND UNDERGROUND WATERS,
For primary bibliographic entry see Field 05G.
W71-10904

WATER POLLUTION CONTROL REGULATIONS.
Nevada Division Of Health, Carson City. Bureau of Environmental Health.
For primary bibliographic entry see Field 05G.
W71-10905

WATER QUALITY CONTROL AT LAKE TAHOE: DISSERTATION ON GRASSHOPPER SOUP,
For primary bibliographic entry see Field 05G.
W71-10906

THE REFUSE ACT OF 1899: ITS SCOPE AND ROLE IN CONTROL OF WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W71-10907

A REGULATION RELATING TO WATER QUALITY STANDARDS FOR INTRASTATE WATERS OF THE STATE OF WASHINGTON AND A PLAN FOR IMPLEMENTATION AND ENFORCEMENT OF SUCH STANDARDS.
Washington Water Pollution Control Commission, Olympia.
For primary bibliographic entry see Field 05G.
W71-10908

RULES OF THE TEXAS WATER QUALITY BOARD.
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 05G.
W71-10909

MONTANA WATER QUALITY CRITERIA, WATER USE CLASSIFICATIONS, AND POLICY STATEMENTS.
Montana Dept. of Health, Helena. Div. of Environmental Sanitation.
For primary bibliographic entry see Field 05G.
W71-10910

WASTE DISCHARGE REQUIREMENTS.
California Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05G.
W71-10911

POLICY ON WATER POLLUTION CONTROL LAW ENFORCEMENT BY THE PARKS AND WILDLIFE DEPARTMENT.
Texas Parks and Wildlife Department, Austin.
For primary bibliographic entry see Field 05G.
W71-10915

THE RAILROAD COMMISSION LOOKS AT POLLUTION,
For primary bibliographic entry see Field 05G.
W71-10916

THE TRIAL OF A WATER POLLUTION CASE (LIABILITY FOR POLLUTION OF SUBTERRANEAN WATERS),
For primary bibliographic entry see Field 05G.
W71-10917

KENTUCKY LAW ON WATER,
Kentucky Legislative Research Comm, Frankfort.
For primary bibliographic entry see Field 05G.
W71-10918

INDUSTRIAL WASTES.
Pennsylvania Sanitary Water Board, Harrisburg.

Article 600, Rules and Regulations, n. d. 7 p, 2 tab.

Descriptors: *Pennsylvania, *Industrial wastes, *Water pollution control, *Standards, Water quality control, Regulation, Administration, Administrative agencies, Administrative decisions, Legal aspects, Water law, Environmental sanitation, Water pollution, Water quality, Pollution abatement, Waste treatment, Waste disposal, Waste water disposal, Waste water treatment, Adoption of practices, Waste water (Pollution), State governments, State jurisdiction, Treatment facilities.

The Sanitary Water Board will set forth the degree of treatment required for sewage and will specify that industrial wastes shall be given specified or equivalent treatment. General standards for industrial wastes are herein prescribed. Specific standards are provided for the following types of industrial wastes: (1) milk processing; (2) mineral preparation; (3) pulp, paper, and paperboard; (4) oil and natural gas; (5) other well wastes; (6) phenolic bodies; (7) oil-bearing waters; (8) distillery by-products; (9) tannery waters; (10) cyanides; (11) all subterranean disposals; and (12) heated wastes. (Robinson-Florida)
W71-10919

INTERNATIONAL ADMINISTRATIVE DUE PROCESS AND CONTROL OF POLLUTION--THE CANADIAN ARCTIC WATERS EXAMPLE,
For primary bibliographic entry see Field 05G.
W71-10920

SOLID WASTE DISPOSAL.
Oregon Revised Statutes secs 459.010 thru 459.990 (1969).

Descriptors: *Oregon, *Solid wastes, *Waste disposal, *Environmental sanitation, Legislation, Legal aspects, Public health, Diseases, Sanitary engineering, Standards, Air, Legal aspects, Public health, Diseases, Sanitary engineering, Standards, Air pollution, Water pollution, Regulation, Local governments, Water quality control.

To protect the public welfare, it is Oregon's public policy to regulate solid waste disposal and disposal sites. The Environmental Quality Commission shall promulgate rules governing storage and disposal of solid waste to prevent: (1) vector production and sustenance, (2) disease transmitting conditions, (3) air pollution, (4) surface and ground water pollution, (5) hazards to workers or the public, and (6) spillage from waste disposal vehicles. Rules governing disposal sites must take into account: (1) adaptability of the site to the population served, (2) standards of design and management, (3) regulation of open burning, and (4) salvage operations. Entry on private premises is permitted to determine compliance. The Commission is authorized to receive federal or private donations. Counties are allowed to enact ordinances prohibiting the storage on private property of solid waste offensive to the public health and providing for abatement of offensive conditions. Procedures for abatement suits are specified. Counties are also empowered to provide coordinated programs for collection and disposal of solid waste or to franchise waste collection or disposal. (Gallagher-Florida)
W71-10921

THE REFUSE ACT: ITS ROLE WITHIN THE SCHEME OF FEDERAL WATER QUALITY LEGISLATION.
For primary bibliographic entry see Field 05G.
W71-10922

AREAS SURROUNDING CERTAIN WATER IMPOUNDMENTS.
Kansas Statutes Ann secs 65-184 thru 65-189f (Supp 1970).

Descriptors: *Kansas, *Reservoir operation, *Water quality control, *Regulation, Legal aspects, Water pollution, Sanitary engineering, Legislation, Organic wastes, Septic tanks, Cesspools, Domestic wastes, Sewage disposal, Waste water disposal, Standards, Water pollution control.

The purpose of this Act is to regulate and control development of areas surrounding reservoirs in order to prevent water pollution. The state board of health is authorized to designate specified areas surrounding reservoirs as sanitation zones. Within these zones, the board is authorized to adopt regulations fixing minimum standards for: (1) control of sanitation in water supplies, (2) sewage and refuse disposal, and (3) construction and maintenance of septic tanks and cesspools. The county is authorized to approve sanitation plans submitted by property owners within such zones and to enforce the provisions of the Act by appropriate legal action. When the owner of property within a sanitation zone proposes a subdivision, he must submit a preliminary engineering study and sanitation plan for all proposed lots. The sanitation plan must be approved before approval of the proposed subdivision. The deed to any subdivided lot must state that it is within a sanitation zone and subject to its regulations. A property owner may appeal the decision of the county authorities. Certain lands are specifically exempted from the Act, and there is a provision for waiver in hardship cases. (Gallagher-Florida)
W71-10923

ENVIRONMENTAL ISSUES IN REACTOR LICENSING,
For primary bibliographic entry see Field 05G.
W71-10924

SOLID WASTE.
Kansas Statutes Ann secs 65-3401 thru 65-3416 (Supp 1970).

Descriptors: *Kansas, *Waste disposal, *Permits, *Regulation, Legislation, Legal aspects, Waste dumps, Domestic wastes, Municipal wastes, Pollution abatement, Environmental engineering, Sanitary engineering, Pollutants, Financing, Standards, Public health, Operations.

The public welfare of Kansas citizens requires the safe and sanitary disposal of solid wastes. To achieve this objective, an advisory council is established to recommend an acceptable plan for financing solid waste disposal systems. Each county must either submit a workable disposal plan or comply with all statutory requirements within two years. Each plan must contain the elements required by this Act, including required anti-pollution measures. After considering recommendations of the advisory council, the board of health is authorized to: (1) adopt necessary public health rules relative to solid waste management, (2) administer the solid waste

program, (3) make recommendations to the legislature, (4) develop a statewide solid waste management plan, (5) cooperate with other government agencies, (6) conduct research, (7) issue permits and conduct inspections, and (8) order alterations in systems to prevent pollution. After 1976 it will be unlawful to operate a solid waste disposal system without a permit unless excused by the Act. Cities and counties are authorized to provide solid waste collection and disposal or to contract therefor. Procedures for enforcement of the Act and for appealing decisions of the board are specified. (Gallagher-Florida)
W71-10925

NATIONAL ENVIRONMENTAL PROTECTION POLICY,
For primary bibliographic entry see Field 05G.
W71-10926

POLLUTION CONTROL FACILITIES EXEMPT FROM TAXATION.
Idaho Code sec 63-105T (Supp 1970).

Descriptors: *Idaho, *Water pollution control, *Tax rate, *Administrative agencies, Water pollution, Pollution abatement, Taxes, Government finance, Non-structural alternatives, Environmental sanitation, State governments, Administration, Administrative decisions, Regulation, Water policy, Water resources, Water quality, Water quality control, Legislation, Legal aspects, Financing.

Facilities, installations, machinery, or equipment, attached or unattached to real property, and utilized in the elimination, control or prevention of water pollution shall be tax exempt. The state tax commission or county assessor shall determine the exempt portion of such property, and shall not include as exempt any portion of the facilities which have value as a specific source of marketable by-products. If any water corporation has been ordered to install equipment for the elimination, control, or prevention of water pollution, the Idaho public utilities commission shall notify the Idaho state tax commission of the percentage such property bears to the total invested plant of the company and said portion shall be exempt from ad valorem taxation. This percentage may be contested by any party at a public hearing before the Idaho state tax commission. (Robinson-Florida)
W71-10927

STATUTORY TREATMENT OF INDUSTRIAL STREAM POLLUTION,
For primary bibliographic entry see Field 05G.
W71-10928

REGULATING DISPOSAL OF SEWAGE AND LITTER.
New York Navigation Law sec 33-c as amended (McKinney Supp 1970).

Descriptors: *New York, *Boating regulations, *Sewage disposal, *Sewage treatment, Legislation, Regulation, Water law, Legal aspects, State governments, Administrative agencies, Standards, Marinas, Boats, Ships, Inspection, Water pollution sources, Water pollution, Water pollution control, Public health, Disinfection, Environmental sanitation.

No person shall discharge from any watercraft, marina or mooring, any sewage or other liquid or solid materials which render the water unsightly, noxious, or otherwise unwholesome to the detriment of public health, welfare, or enjoyment of the water for recreational purposes. No marine toilet on any watercraft used in the state shall operate so as to discharge any untreated sewage into the water. Every marine toilet on any watercraft used in the state shall be equipped with a pollution control device, of a type approved by the state health department. All marinas shall be required to provide suitable trash receptacles which can be conveniently utilized by watercraft users. All marinas that provide for the handling and disposal of sewage from holding tanks of watercraft shall do so in a manner that will prevent water pollution. No marine toilet pollution control device shall be used, sold, or physically offered for sale in the state unless it is of a type which has been officially approved by the department. The disinfecting agent used in each facility shall not be toxic when discharged as effluent. (Johnson-Florida)
W71-10929

STUDY, INVESTIGATION AND EXPLORATION OF UNDERGROUND WATER SUPPLY (TEXAS); NATURAL POLLUTION OF TRIBUTARIES OF RED RIVER: STUDY OF CAUSES AND MEANS OF ELIMINATION.
Texas Civil Statues Ann art 7537a, 7537b (Supp 1970).

Descriptors: *Texas, *On-site investigations, *Water supply, *Pollutant identification, Water sources, Pollution abatement, Water policy, Water resources, Underground streams, Water yield improvement, Water users, Water utilization, Water quality, Administration, Institutions, Water pollution, Streams, Exploration, Testing, Water pollution sources, Water pollution control, Feasibility studies, Path of pollutants.
Identifiers: *Red River.

The Texas Water Development Board is authorized and empowered to study, investigate, and explore the physical characteristics of water-bearing formations, and the sources, quantity, and quality of the state's underground water supply. The Board shall work toward conserving, preserving, and promoting the quality of this supply. The Board, in their judgment, shall first work in areas of immediate need. In determining areas of need the Board shall look to the interest and welfare of domestic and municipal uses, commercial, irrigation, and other beneficial uses essential to the state's welfare. Such exploration may be by coring or other mechanical and electrical means. The Texas Board of Water Engineers is directed to study salt springs, gypsum beds, and other sources of natural pollution to the tributaries of the Red River. The objective of this study is to develop means to eliminate such natural pollution. (Rees-Florida)
W71-10930

THE USE OF THE FEDERAL INCOME TAX SYSTEM TO COMBAT AIR AND WATER POLLUTION: A CASE STUDY IN TAX EXPENDITURES,
For primary bibliographic entry see Field 05G.
W71-10931

PUBLIC HEALTH REGULATIONS.

Alaska Statutes secs 18.05.040, 18.05.070 (1969).

Descriptors: *Alaska, *Regulation, *Administrative agencies, *Public health, Human diseases, Vectors (Biology), Water pollution, Water purification, Water pollution control, Sanitary engineering, Mortality, Diseases, Waste disposal, Water supply, Environmental sanitation.

The Alaska Commissioner of Health and Welfare shall promulgate regulations governing: (1) control of communicable diseases, (2) prevention of public health nuisances, (3) regulation of sanitation, (4) cooperation with local health officials, (5) promotion of public health and prevention of disease, (6) isolation of contagious diseases, (7) transportation of corpses, (8) QUARANTINE, (9) sanitation of establishments which may cause disease, (10) protection of public water supplies, and (11) standards for sewage disposal. Relevant terms are defined. (Hart-Florida)
W71-10932

POLLUTION IN PERSPECTIVE: A SURVEY OF THE FEDERAL EFFORT AND THE CASE APPROACH,
For primary bibliographic entry see Field 05G.
W71-10933

AMORTIZATION OF ADJUSTED BASIS OF DEVICE TO CONTROL WATER POLLUTION OR TO REMOVE ATMOSPHERIC POLLUTANTS.
California Agricultural Code Ann secs 17226, 17226.5 (West 1970).

Descriptors: *California, *Water pollution treatment, *Amortization, *Taxes, Legislation, State governments, Legal aspects, Water pollution control, Pollution abatement, Water quality control, Water resources development, Depreciation, Treatment facilities, Equipment, Water treatment, Financing, Government finance.

The owner of any device, machinery, or equipment for water pollution control shall be entitled to a deduction with respect to the personal income tax. The deduction allowed shall be the amortization of the cost of such asset. The cost shall be amortized over a period of 60 months and the deductions shall be determined monthly. The deduction for a month shall be an amount equal to the adjusted basis of the device, machinery, or equipment at the end of such month divided by the number of months remaining in the 60-month period. This amortization deduction shall be an alternative to the deduction allowed for writing off the actual costs of exhaustion, wear and tear, and obsolescence incurred by the assets. A third alternative available to the owner of such assets shall be the deduction of the total costs of the assets in the taxable year in which the asset was completed or acquired or in which it was certified by the State Department of Public Health. The election of the method of amortization shall be made by the taxpayer in the prescribed manner. (Johnson-Florida)
W71-10934

AN INTRODUCTION TO ENVIRONMENTAL LAW,
For primary bibliographic entry see Field 05G.
W71-10935

ENVIRONMENTAL CONSERVATION LAW.
New York Environmental Conservation Law secs 1 thru 129 (McKinney 1970).

Descriptors: *New York, *Administrative agencies, *Water pollution control, *Water resources development, Legislation, Legal aspects, State governments, Regulation, Water law, Water policy, Water quality control, Administration, Planning, Standards, Management, Public health, Social aspects, Environment, Environmental effects.

It is the policy of the state of New York to conserve, improve and protect its environment and control water, land, and air pollution in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well being. The state department of environmental conservation, headed by an appointed commissioner, shall be responsible for carrying out this policy. To assist the department in this responsibility, it shall be authorized to perform many functions, including promulgation of environmental standards and criteria. The department shall formulate and revise a statewide plan for the protection of the environment and natural resources. Within the department is the state environmental board, which is designed to assist the commissioner and provide a forum for matters relating to the quality of the environment. The board must approve the environmental standards and criteria proposed by the commissioner. A council of environmental advisors is established to provide counsel to the governor on matters of environmental policy. Specific duties of the department and board are enumerated. (Johnson-Florida)

W71-10936

AN ACT CREATING A DEPARTMENT OF ENVIRONMENTAL CONSERVATION.
Ch 120, Laws of Alaska (1971).

Descriptors: *Alaska, *Administrative agencies, *Water pollution control, *Pollution abatement, Administration, Administrative decisions, Regulation, Legislation, Legal aspects, Water law, Water pollution, Water quality, Water quality control, Environmental sanitation, Water policy, Standards, Waste disposal, Waste water disposal, Waste water (Pollution), Wastes, Permits, State governments, Adoption of practices, Supervisory control (Power), Conservation.

The Department of Environmental Conservation and an Environmental Advisory Board consisting of the Commissioner and eight members appointed by the Governor are hereby created. The powers and duties of the Department and the functions of the Board are herein detailed. Grants and loans are provided for waste treatment works and water systems approved for federal grants. An Alaska Environmental Plan shall be prepared, and a Water Pollution Control Plan shall be adopted by the Department. Pollution, quality, and purity standards may be established. Persons who operate commercial or industrial operations discharging wastes into state waters must obtain waste disposal permits. Procedures for obtaining, terminating or modifying said permits are herein set forth. Compliance orders may be issued for violations of regulations issued pursuant to the statute. The pollution of water by ballast water and oil is forbidden, and civil and criminal penalties are provided for violations. A person is guilty of creating or maintaining a nuisance if he pollutes or impairs the quality of a body of water which may be used for domestic purposes. Emergency powers are provided if the Commissioner finds that delay presents imminent dangers. (Robinson-Florida)
W71-10937

WATER WELL DRILLERS ACT.
Texas Civil Statutes Ann art 7621 e (Supp 1970).

Descriptors: *Texas, *Administrative agencies, *Well regulations, *Drilling, Water pollution control, Legislation, Legal aspects, Administration, Regulation, Logging (Recording), Wells, Subsurface waters, State governments, Water pollution, Water resources, Water supply, Water sources, Water rights, Water policy, Water law, Supervisory control (Power), Groundwater.

Water well drillers must obtain certificates of registration; the requirements and administrative procedures applicable thereto are set forth in this Act. The Texas Water Commission may issue a certificate of registration to one who holds such a certificate from another state. Revocation procedures are also set forth. Water well drillers must keep and deliver copies as well logs to the Commission. The organizational structure and responsibilities of the Water Well Drillers Board are herein specified. The Board shall adopt and enforce necessary regulations. Appeals from decisions of the Board prosecuted in Texas courts shall constitute trials de novo. Appeal procedures are specified. The Act also states the duties of the Texas Water Commission in relation to this Act. This Act may be suspended in drought disaster areas. Criminal punishment is provided for violations of the Act's provisions. All well drillers must mark their rigs with their license numbers. Each driller shall inform the person having the well drilled when such well must be plugged to avoid injury or pollution. Nothing herein shall affect the ownership or rights of land owners in underground water. (Robinson-Florida)
W71-10938

SALE OR DISPOSAL OF SALT WATER FOR POLLUTION CONTROL.
Texas Civil Statutes Ann Art 7621f (Supp 1970).

Descriptors: *Texas, *Water pollution control, *Water districts, *Saline water intrusion, Saline water, Financing, Legislation, Legal aspects, Water law, Administration, Administrative agencies, Water pollution, Water pollution sources, Government finance, State governments, Costs, Pipelines, Pipes, Piping systems (Mechanical), Pumps, Pollution abatement, Saline water-freshwater interfaces, Contracts.

Any water power control district is authorized to contract for the sale or disposal of salt water when necessary for pollution control purposes. If it is necessary to guarantee a constant flow of water in order to effect the sale or disposal of salt water, fresh water may be sold or disposed of to the extent necessary to achieve pollution control. Water Power control districts are authorized to issue revenue bonds, without an election, for the construction and acquisition of pipe lines, pumps, and all facilities necessary for the sale or disposal of salt water for pollution control. Details and requirements for the issuance of such bonds are set forth. Water power control districts are authorized to accept any pollution control works or facilities provided by non-profit corporations through the issuance of bonds. (Robinson-Florida)
W71-10939

REGULATIONS GOVERNING WATER CLASSIFICATION AND CONTROL OF QUALITY.
Vermont Water Resources Board, Montpelier. Agency of Environmental Conservation.
For primary bibliographic entry see Field 05G.
W71-10940

MANUFACTURE AND USE OF CONTAMINANTS.
Indiana Stream Pollution Control Board, Indianapolis.
For primary bibliographic entry see Field 05G.
W71-10941

REQUIREMENT FOR SUBMISSION OF MONTHLY OPERATION REPORTS BY INDUSTRIAL, COMMERCIAL, OR AGRICULTURAL TREATMENT FACILITIES.
Indiana Stream Pollution Control Board, Indianapolis.
For primary bibliographic entry see Field 05G.
W71-10942

AMORTIZATION OF CERTIFIED POLLUTION CONTROL FACILITIES.

Hawaii Revised Statutes sec 235-11 (Supp 1970).

Descriptors: *Water pollution control, *Hawaii, *Treatment facilities, *Amortization, Water pollution, Air pollution, Application Equipment, Taxes, Tax rate, Payment, Deferred costs, Depreciation, Construction, Construction costs, Pollution abatement, Federal government, State governments, Administrative agencies, Regulation, Permits, Environmental engineering, Public health, Local governments, Non-structural alternatives.

At his election, every person shall be entitled to a deduction with respect to the amortization of the amortizable basis of any certified pollution control facility as stipulated in section 169 of the Internal Revenue Code of 1954, as amended by section 704 of the Tax Reform Act of 1969. This deduction is available only when: (1) a facility's construction, reconstruction, or erection is completed by the taxpayer after December 31, 1969; or (2) a facility is acquired after December 31, 1969, if the original use of the property commences with the taxpayer after that date provided the facility is operational before January 1, 1975. Any control facility or equipment purchased, constructed, or installed pursuant to regulations of the department of health or a local governing body is to be certified by the state pollution control agency as conforming to state requirements for controlling pollution. Written notice of election must be filed, along with the certificate of approval from the state pollution control agency, with the department of taxation on or before the filing date for the first taxable year in which the election applies. (Rees-Florida)
W71-10943

RULES, REGULATIONS, CLASSIFICATIONS AND WATER QUALITY STANDARDS APPLICABLE TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dep't of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 05G.
W71-10944

WATER QUALITY STANDARDS.
Massachusetts Water Resources Commission, Boston. Div. of Water Pollution Control.
For primary bibliographic entry see Field 05G.
W71-10945

POLICY ON WASTEWATER TREATMENT PLANT OUTFALLS.
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W71-10946

POLICY ON PHOSPHOROUS REMOVAL FROM EFFLUENT.
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05G.
W71-10947

WATER QUALITY ACTIVITIES.
For primary bibliographic entry see Field 05G.
W71-10948

COUNTY BOARDS AUTHORIZED TO PREVENT AND ABATE WATER POLLUTION.

Revised Statutes of Nebraska sec 23-174.10 (Supp 1969).

Descriptors: *Nebraska, *Pollution abatement, *Water pollution, *Water pollution control, Water pollution sources, Water quality control, Legal aspects, Water law, Legislation, Local governments, State governments, Supervisory control (Power), Zoning.

The county board of any county which has adopted zoning regulations is authorized by this section to make regulations concerning public health and welfare. Expressly included in this authority is the power to prevent, abate and remove nuisances, including water pollution. (Madsen-Florida)
W71-10949

WATER QUALITY CRITERIA FOR INTERSTATE AND COASTAL WATERS.
Mississippi Air and Water Pollution Control Comm, Jackson.
For primary bibliographic entry see Field 05G.
W71-10950

WATER CLASSIFICATION--STANDARDS SYSTEM FOR THE STATE OF SOUTH CAROLINA.
South Carolina Pollution Control Authority, Columbia.
For primary bibliographic entry see Field 05G.
W71-10951

CONTROL, PREVENTION, AND ABATEMENT OF POLLUTION OF SURFACE WATERS.

North Dakota Century Code Ann secs 61-28-01 thru 61-28-08 (Supp 1969).

Descriptors: *North Dakota, *Water pollution control, *Water quality control, *Administrative agencies, Non-structural alternatives, Sewage treatment, Legislation, Water permits, Regulations, State governments, Pollution abatement, Inspection, Standards, Water pollution treatment, Public health, Recreation, Multiple-purpose projects, Water treatment, Waste treatment, Supervisory control (Power), Water policy, Waste disposal.
Identifiers: *Injunction (Prohibitory).

Pollution of any waters of the state is prohibited. This prohibition includes the direct discharge of wastes which reduce water quality below established standards and the depositing of wastes on a location where they are likely to cause pollution. Any unauthorized construction or modification of waste disposal facilities or any increase beyond allowable waste discharge rates is also prohibited. The prohibitions represent an express policy to act in the public interest to maintain and improve water quality and to require reasonable waste treatment. A North Dakota Water Pollution Control Board is herein created to effectuate this policy and its derivative prohibitions. The Board is an independent arm of the Department of Health; both organizations operate in concert to establish water quality standards. Other duties of the Board include developing comprehensive pollution prevention, control, and abatement programs; requiring the construction, modification, and proper maintenance and operation of disposal systems; and exercising all powers necessary to carry out the purposes of this Act. Persons who violate the Act or any provision made thereunder shall be guilty of a misdemeanor, and injunctive relief may be obtained by the Department. (Kohla-Florida)
W71-10952

WYOMING SPILLS CONTINGENCY PLAN.
Wyoming Dept. of Health and Social Services, Cheyenne. Div. of Health and Medical Services.
For primary bibliographic entry see Field 05G.
W71-10953

COMPREHENSIVE STATEWIDE SOLID WASTE MANAGEMENT PLAN; POWERS AND DUTIES OF THE COMMISSIONER OF THE STATE DEPARTMENT OF HEALTH.

Arizona Revised Statutes Ann secs 36-132.01, 36-136, 36-142, as amended (Supp June 1971).

Descriptors: *Arizona, *Solid wastes, *Environmental sanitation, *Administrative agencies, Public health, Treatment facilities, State governments, Local governments, Financing, Government finance, Grants, Administration, Programs, Legislation, Legal aspects, Inspection, Waste treatment, Waste disposal, Administrative decisions, Coordination, Programs, Project planning, Long-term planning.

The Department of Health, in accordance with guidelines developed jointly with the State Health Planning Authority, shall prepare a comprehensive, statewide solid waste management plan for the collection, storage, transportation, processing, reclamation, and disposal of solid wastes. All counties, cities, towns, and appropriate state agencies shall prepare and submit to the Department a plan for solid waste management. Procedures for adopting the statewide plan are prescribed. In order to implement the purposes of this statute, the Department, counties, cities, and towns may accept and expend any funds granted to it by the state or federal government or any private agency. The powers and duties of the Commissioner of the Department of Health are enumerated. The Commissioner may, if he has reasonable cause to believe that there exists a violation of any health law or regulation, inspect any person or property in transportation through the state and any vehicle in which such person or property is transported. The Commissioner may enforce detention or disinfection as necessary for the public health. Authority to delegate any duty or power of the Commissioner is provided. (Shelnut-Florida)
W71-10954

WATER POLLUTION CONTROL (ADMINISTRATIVE ORGANIZATION).
Arizona Revised Statutes Ann secs 36-1853, 36-1869, as amended (Supp June 1971).

Descriptors: *Arizona, *Water quality control, *Water pollution control, *Administrative agencies, Planning, Coordination, Programs, Water policy, Safety, Public health, State governments, Legislation, Legal aspects, Administration, Pollution abatement, Adoption of practices, Supervisory control (Power).

A State Water Quality Control Council is hereby established and shall consist of the following thirteen members: (1) the Commissioner of Public Health acting as a liaison between the Council and the Board in effecting an efficient and correlated use of personnel and policies of the council; (2) a member of the Game and Fish Commission; (3) a member of the Oil and Gas Conservation Commission; (4) the State Land Commissioner; (5) a member of the Arizona Water Commission; (6) the Dean of the Agricultural College of the University of Arizona; and (7) seven citizens of the state who shall be appointed by the Governor. The Governor shall also have authority to remove any citizen appointed to the council. The Council's organization is prescribed. All members shall have one vote. A majority of the Council shall constitute a quorum, and the concurrence of a majority in any matter within its powers shall be required for any determination. The State Board of Health, the Council, and the Department of Health shall cooperate with the Arizona Water Commission in the formulation of plans relative to the quality and safety of state waters. (Shelnut-Florida)
W71-10955

WATER QUALITY STANDARDS.
Wisconsin Admin Code chs RD 2 thru RD 4 (1970).

Descriptors: *Wisconsin, *Standards, *Water quality control, *Water pollution control, Water pollution, Pollution abatement, Water pollution sources, Pollutants, Water pollution effects, Impaired water quality, Water utilization, Potable water, Public health, Recreation, Fish, Industrial water, Dissolved oxygen, Bacteria, Dissolved solids, Oil, Taste, Odor, State governments, Regulation, Legal aspects.

To preserve and enhance the quality of Wisconsin's waters, standards are herein established to govern water management decisions. Minimum standards applicable to all waters forbid the presence of foreign materials in such amounts as to cause a nuisance. Included in this category are substances causing objectionable shore deposits; floating or submerged debris or oil; materials producing color, odor, taste or unsightliness; and toxic substances. Specific standards are set forth for waters classified by use for: (1) public water supply, (2) fish and other aquatic life, (3) recreational use, and (4) industrial and cooling water use. Criteria used in determining water quality include specific levels of bacteria, dissolved solids, pH, dissolved oxygen, and temperature. Financial assistance, industrial incentives, increased surveillance, regulatory orders, and legal action will be used to implement and enforce the water quality standards herein established. All polluters will be required to meet specific time schedules in complying with orders. Uses and standards are set forth for interstate and intrastate waters, and specific rivers, lakes and regions are classified. (Smiljanich-Florida)
W71-10956

WATER POLLUTION CONTROL.
Revised Statutes of Nebraska sec 71-3001 thru 71-3012 (Supp 1969).

Descriptors: *Nebraska, *Water pollution control, *Administrative agencies, *Regulation, Water pollution, Pollution abatement, Water, Water permits, Water law, Water quality control, Standards, Control, Abatement, Inspection, Legal aspects, Water policy, Administrative decisions.

A water control council is created within the state department of health to exercise control over water pollution. The organization of the council is established and shall include an executive secretary, who must be a person fully trained and experienced in water pollution control. The council is empowered to develop comprehensive programs for the prevention, control, and abatement of new or existing pollution of state waters through its own actions and by coordinating the actions of other state agencies. The council is required to classify the waters of the state and establish uniform standards of water quality. Certain acts are proscribed; the council is empowered to enforce these statutory prohibitions along with its own regulations. All regulations and water quality standards must be determined at public hearings before the council. Penalties for violations of the statute and council regulations include monetary fines, costs of replenishing damaged fish and wildlife, and injunctive relief against further pollution. An elaborate procedure for appeal from council decisions is established, and the state attorney general is designated to represent the council. (Horwitz-Florida)
W71-10957

NEBRASKA CLEAN WATERS COMMISSION ACT.
Revised Statutes of Nebraska secs 71-4201 thru 71-4234 (Supp 1969).

Descriptors: *Nebraska, *Waste treatment, *Administrative agencies, *Financing, Waste disposal, Sewage, Solid wastes, Waste water (Pollution), Sewage disposal, Sewage treatment, Waste water treatment, Treatment facilities, Water pollution treatment, Municipal wastes, Water pollution, Water pollution control, Treatment, Loans.

The Nebraska Clean Waters Commission is established to assist municipalities in the planning and financing of waste water treatment works, waste water collection systems, and solid waste disposal facilities. The organization and procedural rules governing the Commission's membership are set forth, with the power of appointment vested in the Governor. The Commission is given the responsibility of providing financial arrangements to furnish municipalities with the means with which to participate in federal programs for the prevention, abatement, and control of water pollution. The Commission is empowered to issue bonds to finance municipal treatment facilities. Elaborate procedures are put forth governing the Commission's power to issue bonds, the bond indenture agreements, and repayment of the obligations. The work of the Commission is declared to be an essential governmental function, but the Commission is not authorized to pledge the full faith and credit of the state or any municipality. (Horwitz-Florida)
W71-10958

ARKANSAS WATER WELL CONSTRUCTION ACT.
Act 641, General Acts of Arkansas, p 1405-1420 (1969). 16 p.

Descriptors: *Arkansas, *Well regulations, *Administrative agencies, *Well permits, Drilling, Permits, Wells, Water conservation, Inspection, Regulation, Water, Water pollution, Drilling equipment, Pumps, Control, Standards, Water policy, Water pollution control.

In order to protect and conserved a supply of potable water for future generations, this Act establishes comprehensive rules governing water well contractors, water well drillers, and specifications for well construction. The newly created Committee on Water Well Construction is made responsible for the administration of the Act and empowered to adopt necessary rules governing the construction, repair, and abandonment of water wells. Water well drillers and contractors must be licensed by the Committee on a yearly basis; the Committee retains the power to suspend or revoke a license for any violation of this Act or any Committee regulation. The Act does not apply to any well already in existence, but the abandonment or repair of any such well shall bring the same under the jurisdiction of the Act and the Committee. Penalties for violation of this Act are established as misdemeanors punishable by fine, imprisonment, and loss or suspension of license. (Horwitz-Florida)
W71-10959

RULES AND REGULATIONS FOR SUBSURFACE DISPOSAL SYSTEMS.
Colorado Dept. of Health, Denver. Water Pollution Control Commission.
For primary bibliographic entry see Field 05G.
W71-10960

GUIDELINES FOR CONTROL OF WATER POLLUTION FROM MINE DRAINAGE.
Colorado Dept. of Health, Water Pollution Control Comm, Denver.
For primary bibliographic entry see Field 05G.
W71-10961

PUBLIC HEARINGS (CERTAIN COMMISSION ACTION PREDICATED ON PUBLIC HEARINGS).
Kentucky Water Pollution Control Commission, Frankfort.

Regulation WP-2, 1961. 13 p.

Descriptors: *Kentucky, *Administrative agencies, *Water pollution control, *Decision making, State governments, Legal aspects, Non-structural alternatives, Regulation, Permits, Political aspects, Abatement, Pollution abatement, Water pollution, Administration.

The Water Pollution Control Commission is required to hold a public hearing: (1) before issuing a pollution abatement order; (2) prior to the modification, revocation or continuation of a permit; and (3) before the adoption of new rules and regulations for the prevention, abatement, or control of water pollution. Depending upon the particular circumstances, 20 or 30 days notice is mandatory. Failure to appear before the Commission may result in a contempt of court citation, and may serve as a confession of all allegations of the complaint. Standard rules of procedure for the conduct of the hearings are promulgated. These rules include the right of the accused to examine and cross-examine evidence and witnesses produced in support of the complaint. Orders which result from the hearings may be appealed to the Franklin County Circuit Court and thereafter to the Kentucky Court of Appeals. Complaint and notice forms are included in the regulations. (Kohla-Florida)
W71-10962

RULES FOR SITE LOCATION APPROVAL OF SEPTIC TANK SYSTEMS.
Colorado Dept. of Health, Denver. Water Pollution Control Commission.
For primary bibliographic entry see Field 05G.
W71-10963

WATER QUALITY STANDARDS FOR SURFACE WATERS OF NORTH DAKOTA.
North Dakota State Dept. of Health, Bismarck.
For primary bibliographic entry see Field 05G.
W71-10964

ENFORCEMENT OF WATER POLLUTION LAWS IN OKLAHOMA.
For primary bibliographic entry see Field 05G.
W71-10965

NEW WINE IN OLD BOTTLES: THE FEDERAL REFUSE ACT PERMIT PROGRAM,
For primary bibliographic entry see Field 05G.
W71-10966

ECONOMIC INCENTIVES FOR POLLUTION ABATEMENT: APPLYING THEORY TO PRACTICE,
For primary bibliographic entry see Field 05G.
W71-10967

WATER POLLUTION CONTROL IN WASHINGTON,
For primary bibliographic entry see Field 05G.
W71-10968

WATER POLLUTION: AN AFFIRMATIVE RESPONSE BY THE CALIFORNIA LEGISLATURE,
For primary bibliographic entry see Field 05G.
W71-10969

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, LYCOMING CREEK IN LYCOMING COUNTY, PENNSYLVANIA.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W71-10584

SPECIAL FLOOD HAZARD INFORMATION, TULSA, OKLAHOMA.
Corps of Engineers, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W71-10585

FLOOD PLAIN INFORMATION OF GRAND RIVER, RED CEDAR RIVER AND SYCAMORE CREEK, LANSING, MICHIGAN AND VICINITY.
Corps of Engineers, Detroit, Mich.
For primary bibliographic entry see Field 04A.
W71-10586

FLOOD PLAIN INFORMATION--COASTAL FLOODING OF THE TOWN OF CAPE CHARLES, VIRGINIA.
Corps of Engineers, Norfolk, Va.
For primary bibliographic entry see Field 04A.
W71-10733

FLOOD PLAIN INFORMATION--SAGE CREEK, VOLUME II, CASPER, WYOMING.
Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 04A.
W71-10734

FLOOD PLAIN INFORMATION, LAKE EARL-LAKE TALAWA AND LOWER SMITH RIVER, DEL NORTE COUNTY, CALIFORNIA.
Corps of Engineers, San Francisco, Calif.
For primary bibliographic entry see Field 04A.
W71-10812

FLOOD PLAIN INFORMATION, WEST FORK WHIT RIVER, TOWN, MUD, SCULL, AND CLEAR CREEKS, FAYETTEVILLE, ARKANSAS.
Corps of Engineers, Little Rock, Ark.
For primary bibliographic entry see Field 04A.
W71-10813

6G. Ecologic Impact of Water Development

WASTE MANAGEMENT IN THE MARINE ENVIRONMENT,
Federal Water Pollution Control Administration, West Kingston, R.I. National Marine Water Quality Lab.
For primary bibliographic entry see Field 05C.
W71-10549

ECOLOGICAL MODELS APPLIED TO RADIONUCLIDE TRANSFER IN TROPICAL ECOSYSTEMS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
G. E. Raines, S. G. Bloom, and A. A. Levin.
Bioscience, Vol. 19, No. 12, p 1086-1091 (1969). 5 fig, 1 tab, 12 ref.

Descriptors: *Mathematical models, *Ecosystems, *Radioisotopes, Tropical regions, Canals, Atlantic Ocean, Pacific Ocean, Fallout, Nuclear explosions, Excavation, Strontium radioisotopes, Tritium, Water pollution effects, Computer models, Food chains, Path of pollutants, Feasibility studies.
Identifiers: Ruthenium radioisotopes.

The dose to man is estimated in connection with feasibility studies of the construction of a sea level canal with nuclear explosives. Provisional results were obtained through an eight compartment model. In one example, about one half of the 50-year dose for strontium-90 was due to the fish pathway, about a quarter was due to plants, a little less than a quarter came from terrestrial animals and a very small fraction came from water. The model is being improved to estimate the maximum probable dose to people living outside an area from which people would be excluded for some time after completion of the excavation, to calculate the radiation dose from higher than anticipated fallout, and to determine how soon any particular part of the area may be reoccupied. (Bopp-NSIC)
W71-10620

THE EFFECTS OF WATER QUALITY AND QUANTITY ON THE FAUNA OF A NON-GLACIAL ALASKAN RIVER,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W71-10649

A PROCEDURE FOR EVALUATING ENVIRONMENTAL IMPACT,
Geological Survey, Washington, D.C.
Luna B. Leopold, Frank E. Clarke, Bruce B. Hanshaw, and James R. Balsley.
Available free on application to the U.S. Geological Survey, Washington, D.C. 20242. Geological Survey Circular 645, 1971. 13 p, 3 fig, 3 ref.

Descriptors: *Environment, *Environmental effects, Water resources development, Habitats, Erosion, Water pollution sources, Sedimentation, Utilization, Cities, Environmental engineering, Safety, Public health.
Identifiers: *Environmental impact.

A procedure is outlined that may assist in developing uniform environmental impact reporting. The system is a matrix which is general enough to be used as a reference checklist or a reminder of the full range of actions and impacts on the environment that may relate to proposed actions. The marked matrix also serves as an abstract of the text of the environmental assessment to enable the many reviewers of impact reports to determine quickly what are considered to be the significant impacts and their relate importance as evaluated by the originator of the impact report. This comparatively simple system is

intended as a guide for the many people who are faced with the evaluation and preparation of environmental impact reports before the results of these studies have been completed. The proposed manner of using the matrix is aimed at separating as far as possible factual information on magnitude of each type impact from the more subjective evaluation of the importance of the impact, the latter involving preference or bias to some degree. (Knapp-USGS)
W71-10688

GENERALIZED FLOOD-FREQUENCY ESTIMATES FOR URBAN AREAS IN MISSOURI,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 04C.
W71-10714

MUST DESTRUCTIVE DEGRADATION COME TO THE WATERS OF THE DELTA AND SAN FRANCISCO BAY.
Contra Costa County Board of Supervisors, Martinez, Calif.

August 1969. 8 p, 4 fig.

Descriptors: *Water distribution, *Water balance, *Water pollution control, *Water quality, Water circulation, Water supply, Water demand, Desalination, Estuarine environment, Inflow, Balance of nature, California, Diversion, Water conveyance.
Identifiers: *San Francisco Bay, *Sacramento-San Joaquin Delta.

The viewpoint is described of Contra Costa County, California concerning the proposed construction of facilities to deliver more than four million acre feet of water yearly from the southern end of the Delta to the desert lands of the lower San Joaquin Valley and Southern California. During the next 30 years, annual exports of water southward from the Delta are scheduled to increase from the present 2,000,000 acre feet to more than 10,000,000 acre feet in the year 2000. Simultaneously, the volume of annual outflows of water through the Delta into San Francisco Bay will diminish from a present yearly average of 18,000,000 acre feet to as little as 7,000,000 acre feet in the year 2000. The existing ecological environment of the Bay-Delta System is based on a historic pattern of fresh water inflows and water outflows that make certain the greater part of the Delta has fresh water in its channels throughout the year. This pattern of inflows and outflows has provided a flushing effect in the Delta that has removed salts and other impurities that otherwise would accumulate and impair water quality and decrease the ability of the Bay-Delta waters to absorb effluent waste materials. (Poertner)
W71-10745

EFFECTS OF STREAM CHANNELIZATION ON FISHES AND BOTTOM FAUNA IN THE LITTLE SIOUX RIVER, IOWA,
Iowa State Univ, Ames. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W71-10751

LET'S CONSIDER OUR ENVIRONMENT.
Indiana Dept. of Commerce, Indianapolis. Div. of Planning.

Available form the National Technical Information Service as PB-197 581, $3.00 in paper copy, $0.95 in microfiche. 1970 Conference Proceedings, Indianapolis, Ind., Sept. 24-25, 1970. 45 p.

Descriptors: *Water resource development, *Land development, *Flood plain insurance, Flood control, *Erosion, *Sedimentation, Planning, Zoning, *Land use, Storm drains.
Soil limitations effecting water management; Managing water--surface and subsurface; Erosion and sediment control; Planning for topography and vegetation utilization; Planning for flood plains; and Resource considerations in the preparation of zoning and subdivision control regulations.
W71-10782

INSTITUTIONS OF EFFECTIVE MANAGEMENT OF THE ENVIRONMENT, PART I.
National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Board.
For primary bibliographic entry see Field 06E.
W71-10802

URBAN RIVERSIDE ENVIRONMENTAL ANALYSIS,
Harland Bartholomew and Associates, Memphis, Tenn.
Richard J. Moore.
Proceedings, American Society of Civil Engineering, Journal of The Urban Planning and Development Division, Vol 97, No UP1, p 105-115, April 1971, 9 fig.

Descriptors: *City planning, *Urbanization, *Environmental engineering, *Methodology, Community development, Banks, Highways, Transportation, Land use, Tennessee.
Identifiers: *Riverfront planning, *Urban environmental analysis, *Memphis (Tenn).

The need for a major highway facility precipitated a total analysis of the riverfront area adjacent to downtown Memphis, Tennessee. Realizing the impact potential of such a facility on the riverfront area, a multidisciplinary team of professionals was established for the study analysis. This team, in consort with local agencies and private interests, established an alignment and design features for the facility. Early in the study, it became apparent that the development of a detailed plan for the entire riverfront area was not only impractical but most probably undesirable since the various governmental agencies involved in the study area were unable, either due to finances or because of project priorities, to become involved in the analysis sufficiently to develop definitive plans. The resultant design is one generally accepted as best when all factors are considered. The plan permits alternative redevelopment for the competing land uses while permitting the major project to proceed, thereby being responsive to the difficulty encountered in scheduling concurrent detailed planning for multiple uses in the corridor. (Davis-Chicago)
W71-10882

THE CAUSES OF POLLUTION,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 05B.
W71-10889

07. RESOURCES DATA

7A. Network Design

SOME COMMENTS ON THE WATER BUDGET OF THE HINDU KUSH AND THE NEIGHBORING MOUNTAINS (IN GERMAN),
Hermann Flohn.
English summary. Erdkunde, Vol 23, No 3, p 205-214, September 1969. 2 fig, 7 tab, 14 ref.

Descriptors: *Mountains, *Hydrologic budget, *Arid lands, *Climatic data, *Precipitation (Atmospheric), Evaporation, Runoff, Monsoons, Convection.
Identifiers: *Afghanistan, *Pakistan, *Hindu Kush.

One of the main goals of the International Hydrological Decade (1965-1975) is an upgrading of our knowledge concerning regional and global water budgets. Currently, the best estimates of yearly mean global precipitation and evaporation vary between 80-100 cm. It is important to obtain accurate figures of these phenomena because of their relation to global heat distribution. Data are especially scanty for many mountainous areas, particularly those of Central Asia because of large gaps in weather station networks. Interpretation of existing data, including some unpublished material, combined with new research by Pakistan and Afghanistan, is expected to lead to a revision of our ideas concerning the arid character of the climate in those areas. Many existing recording stations in these mountains lie in valleys with annual winter and spring precipitations of 100-200 cm. These figures may be distortions of regional data. Precipitation in the Hindu Kush west of the Indus is higher than in the eastern regions. The area of dominant summer precipitation is limited to the Punjab Plain, reflecting summer monsoonal influences, while to the north and east, convective precipitation is most common. (Casey-Arizona)
W71-10487

A PROPOSED STREAMFLOW DATA PROGRAM FOR LOUISIANA,
Geological Survey, Baton Rouge, La.
M. F. Cook, and M. J. Forbes, Jr.
Geological Survey Open-file Report, 1971. 24 p, 3 fig, 7 tab, 7 ref.

Descriptors: *Streamflow, *Network design, *Data collections, *Project planning, *Louisiana, Stream gages, Flow characteristics, Reviews, Regression analysis, Natural flow, Regulated flow, Hydrologic data, Water resources development, Streamflow forecasting, Watersheds (Basins), Gaging stations.

An evaluation of the streamflow data available in Louisiana was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of the long-term goals of the streamflow data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining objectives. It was found that some of the goals could be met by generalization of the data for gaged basins by regression analysis. Significant changes are recommended in the present data program to attain the goals that have been met. A streamflow data program based on the guidelines developed in this study is proposed for the future. Since the start of the stream-gaging program in 1937, the U. S. Geology Survey, Louisiana District has operated stream-gaging stations at a total of 123 sites, stage stations at 42 sites, crest-stage stations at 277 sites, low-flow stations at 268 sites and has obtained miscellaneous data at many other locations. (Woodard-USGS)
W71-10574

LOS ALAMOS ENVIRONMENTAL MONITORING PROGRAM,
Los Alamos Scientific Labs., N. Mex.
For primary bibliographic entry see Field 05B.
W71-10622

7B. Data Acquisition

DEVICES FOR CALCULATING AND MEASURING WATER FLOW IN WATER MANAGEMENT SYSTEMS (Pribory dlya ucheta i izmereniya raskhoda vody na gidromeliorativnykh sistemakh),
For primary bibliographic entry see Field 02E.
W71-10587

USE OF A NEUTRON MOISTURE METER (NIV-1) FOR DETERMINING THE MOISTURE

CONTENT OF RED EARTHS (Ispol'zovaniye neytronnogo vlagomera (NIV-1) dlya opredeleniya vlazhnosti krasnozemov),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02G.
W71-10592

APPLICATION OF MAGNETOHYDRODYNAMICS TO MEASUREMENT OF LIQUID VELOCITY AND TURBULENCE,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 08B.
W71-10644

A COMPARISON OF TWO METHODS FOR MEASURING RIGIDITY OF SATURATED MARINE SEDIMENTS,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 08D.
W71-10668

QUICK PREPARATION OF SLIDES OF WELL-ORIENTED CLAY MINERALS FOR X-RAY DIFFRACTION ANALYSES,
Delaware Univ., Newark. Delaware Geological Survey.
Nenad Spoljaric.
Journal of Sedimentary Petrology, Vol 41, No 2, p 588-589, June 1971. 2 p, 1 fig, 1 ref.

Descriptors: *Clays, *Clay minerals, *Sediments, *Laboratory tests, *Electron microscopy, *X-ray diffraction, Analytical techniques, Crystallography, Mineralogy.

Slides of well-oriented clay minerals of unconsolidated sediments were made using a centrifuge. A glass slide was placed in the bottom of a flat-bottom centrifuge tube, clay-size suspension added and then centrifuged for 5 to 10 minutes at 2100 RPM. The remainder of the suspension was then decanted and the clay-coated slide removed from the container and placed under vacuum for speedy drying. Slides prepared in this way were representative of the clay mineral assemblage of the samples; in addition, the clay particles were well-oriented. Time required for the preparation of two (or multiple of two) slides is less than one hour. (Knapp-USGS)
W71-10724

THE USE OF MOMENTS FOR MAPPING VERTICAL VARIABILITY OF CRETACEOUS AQUIFERS IN MISSISSIPPI,
Mississippi State Univ., State College. Dept. of Geology and Geography.
For primary bibliographic entry see Field 02F.
W71-10760

EVALUATION OF RANDOM SELECTION OF DATA ON CURRENTS ON ESTUARY AND COASTAL SECTORS OF THE SEA (OB OTSENKE SLUCHAINOI VYBORKI NABLYU NAD TECHENIYAMI NA USTEVOM VZMORE I V PRIBREZHNOI ZONE MORYA),
For primary bibliographic entry see Field 02L.
W71-10774

POTENTIAL OF SATELLITE MICROWAVE SENSING FOR HYDROLOGY AND OCEANOGRAPHY MEASUREMENTS,
National Environmental Satellite Service, Washington, D.C.
John C. Alishouse, and Donald R. Baker.
Available from the National Technical Information Service as COM 71-00544, $3.00 in paper copy, $0.95 in microfiche. NOAA Technical Memorandum NESS 26, March 1971. 16 p.

Descriptors: *Remote sensing, *Meteorological data, *Instrumentation, *Hydrography, Surveys, Microwaves, Sea ice, Meteorology.
Identifiers: *Meteorological satellites, *Hydrographic surveys, Microwave spectroscopy, Surface roughness, Temperature measurement, Radiometers, Microwave receivers.

Microwave radiometers on unmanned satellites appear usable for detecting sea-ice boundaries through clouds and for obtaining information of sea-surface roughness and temperatures. With the increasing tempo of theoretical and experimental studies in microwave sensors and antenna technology, there appears to be considerable potential for microwave measurements from earth satellites applicable to NOAA's hydrologic and oceanographic services.
W71-10777

EFFECT OF ORGANIC PHOSPHORUS INSECTICIDES ON PLANTS AND ANIMALS,
Joint Publications Research Service, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-10798

RIVER SAMPLER USED IN FROZEN WATER,
City Water Dept. Cedar Rapids, Iowa.
Thomas C. Noth.
Water and Sewage Works, Vol 118, No 6, p 137, 1971. 1 p, 2 fig.

Descriptors: *Data collections, *Sampling, *Ice, *Instrumentation, Surface waters, Methodology, Research and development.
Identifiers: *Water sampler design, Sampling techniques (Ice).

A new method for collecting water samples in frozen waters is presented. Using PVC pipe with two half-round polyurethane strips inserted, the sampler was placed in the Red Cedar River (Iowa) during the winter of 1969-70. The sampler easily released cores of ice up to two feet in length. A revised version of the sampler used in 1970-71 worked so well that no ice was observed in the tube as late as January 20, 1970. (Woodard-USGS)
W71-10820

ELECTROMETRIC METHOD FOR ANALYZING WATER EXTRACTS AND GROUNDWATER (Elektrometricheskiy metod analiza vodnykh vytyazhek i gruntovykh vod),
Tadzhik Scientific Research Inst. of Soil Science, Dushambe.
R. G. Gorbunova.
Pochvovedeniye, No 5, P 132-138, May 1970. 2 fig, 2 tab, 2 ref.

Descriptors: *Instrumentation, *Electrochemistry, *Analytical techniques, *Water chemistry, *Water analysis, Aqueous solutions, Electrical resistance, Conductivity, Measurement, Resistivity, Salinity, Salts, Hydrometers, Saline soils, Groundwater, Electrodes, Chemical analysis.
Identifiers: *USSR, *Electrometers, *Electrometry, Electrical conductivity, Specific resistance, Salinometers, Water extracts.

A P-38 slide-resistance bridge for measuring the specific resistance of aqueous solutions is described. The electrometric method was found to be superior to the conventional chemical method for mass analyses of water extracts and groundwater. The electrometric method is time- and laborsaving and uses less complicated and expensive equipment. The method requires only a reliable instrument for measuring specific resistance and an electrode pipette with platinum electrodes. (Josefson-USGS)
W71-10830

THE EFFECT OF VARYING THE PARAMETERS OF VANE SHEAR TESTS OF MARINE SEDIMENTS,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 08D.
W71-10899

DIRECT SHEAR TESTING OF MARINE SEDIMENT,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 08D.
W71-10900

THE TRACE FLUOROMETRIC DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN NATURAL WATER,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-10914

7C. Evaluation, Processing and Publication

THEORY OF DIMENSIONS AND SPURIOUS CORRELATION,
Queen's Univ. Kingston (Ontario). Dept. of Civil Engineering.
M. S. Yalin, and J. W. Kamphuis.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 2, p 249-265, 1971. 17 p, 4 fig, 6 ref.

Descriptors: *Dimensional analysis, *Correlation analysis, Data processing, Analytical techniques, Mathematical studies, Mathematics.

Dimensional analysis can serve as a powerful tool in experimental investigations of physical phenomena. Its effectiveness becomes especially noticeable when the number of factors involved is large and the theoretical knowledge is insufficient. However, like any other mathematical tool, the theory of dimensions can supply correct and useful results only if it is properly applied. The purpose of this paper is to analyze common forms of spurious correlation. If the dimensionless system is chosen, then the results should not be interpreted in terms of the individual dimensional parameters that form the dimensionless variables since the real variables of the experiment are the dimensionless variables. The usual cause of spurious correlation is the appearance of common quantities along both coordinate axes. This is true for both a dimensional and a dimensionless system. In addition, when considering dimensionless variables, care must be taken that the relationship between Y and X is not brought about only by variation of one or more of the repeating dimensional parameters common to both. (Knapp-USGS)
W71-10475

ASSESSMENT ANALYSIS FOR WATER SUPPLY ALTERNATIVES,
Army Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-10511

COMPUTERS AND URBAN PLANNING,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 06B.
W71-10525

THE SIMULATED CITY: THE USE OF SECOND GENERATION GAMING IN STUDYING THE URBAN SYSTEM,
Envirometrics, Inc.
For primary bibliographic entry see Field 06A.
W71-10529

PUBLIC INVESTMENT CRITERIA AND IDLE RESOURCES: A REGIONAL ANALYSIS,
Grinnell Coll., Iowa.
For primary bibliographic entry see Field 06B.
W71-10531

THE USE OF COMPUTER GRAPHICS IN THE HUDSON RIVER VALLEY,
Hudson River Valley Commission, Tarrytown, N.Y.
Bruce Howlett, and Harold Schneider.
Socio-Economic Planning Sciences, Vol 4, p 119-122, 1970.

Descriptors: *Planning, *Analytic techniques, *Mapping, Computer program, Computer models.
Identifiers: *Computer graphics, *Hudson River valley.

A new computerized method is described for compiling, analyzing, and displaying geographic data being used now by the planning staff of the Hudson River Valley Commission. Input data derived from aerial photographic interpretation and from other sources are selected, weighted, and combined to produce maps containing combinations of different land use and environmental quality factors. A geographic system based upon 1/4 of a square kilometer subdivisions of the UTM gird system is used to reference all data. Data are collected and digitized on an incremental recorder; output is displayed in 10 dark-through-light shadings achieved by overprinting on standard line printers. (Davis-Chicago)
W71-10533

TESTIMONY FOR THE DEFENSE - A CASE FOR COMPUTERS,
Vitro Labs., Silver Spring, Md.
For primary bibliographic entry see Field 06A.
W71-10537

SEASONAL SNOW COVER--A GUIDE FOR MEASUREMENT COMPILATION AND ASSEMBLAGE OF DATA.
For primary bibliographic entry see Field 02C.
W71-10576

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS, METROPOLITAN AREA, 1969,
Geological Survey, Austin, Tex.
G. R. Dempster, Jr. and B. C. Massey.
Geological Survey Data Report, 1970. 50 p, 3 fig, 3 tab.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Urbanization, *Hydrologic data, *Texas, Flow characteristics, Flow rates, Discharge measurements, Stream gages, Peak discharge, Floods, Storms, Data collections, Cities, Hydrographs, Mass curves, Precipitation (Atmospheric).
Identifiers: *Fort Worth (Tex), *Urban hydrology, Flood profiles.

The basic hydrologic data collected in the Fort Worth, Texas area during the 1969 water year (October 1, 1968, to September 30, 1969) are presented. The two basins in the study are Dry Branch and Little Fossil Creek. Noteworthy storms occurred on April 16-17, May 6-7, and September 22, 1969, in the Dry Branch basin; and March 14-15, April 16-17, and May 6-7, 1969, in the Little Fossil Creek basin. Summaries of storm rainfall-runoff data for these individual selected storms at crest-stage partial-record stations and streamflow stations are given. Computations and curves for each storm are shown in the compilation and analysis of data. Other data, including storm and monthly rainfall and daily and monthly runoff for the 1969 water year, are included in the compilation and analysis of data. In addition, flood-profile data for the storms of April 16-17 and May 6-7 are listed. (Woodard-USGS)
W71-10583

DEVELOPMENT OF A STATE WATER-PLANNING MODEL: PART I - METHODOLOGY,
Montana Univ., Bozeman. Joint Water Resources Research Center.
For primary bibliographic entry see Field 06A.
W71-10641

EFFECT OF TURBULENCE PROMOTERS ON LOCAL MASS TRANSFER,
Ionics, Inc., Watertown, Mass.
For primary bibliographic entry see Field 03A.
W71-10666

REDUCTION OF LITHOLOGIC-LOG DATA TO NUMBERS FOR USE IN THE DIGITAL COMPUTER,
Geological Survey, Lawrence, Kans.
Charles O. Morgan, and Jesse M. McNellis.
Mathematical Geology, Vol 3, No 1, p 79-86, 1971. 8 p, 7 tab, 1 ref.

Descriptors: *Logging (Recording), *Data processing, *Data storage and retrieval, *Geologic formations, Subsurface investigations, Data collections.
Identifiers: Lithologic-log data.

A standardized system for conveniently coding lithologic-log data for use in the digital computer involves a reduction of the original written alphanumeric log to a numeric log by use of computer programs. This numeric log can then be retrieved as a written log, interrogated for pertinent information, or analyzed statistically. This coding of lithologic-log data permits entering in the digital computer free form, but logically ordered lithologic logs. The log may be used as detailed or as brief as required. Many logs published or stored in files can be punched directly onto data cards and reduced for storage and retrieval purposes, because most logs are of standard geologic format. Those logs would lose no descriptive material and would be essentially the same as the log originally compiled by the geologist. Repeated use of the data will require a minimum cost after the logs are reduced to numbers, because the computer can work with numbers more efficiently than alphanumeric information. (Knapp-USGS)
W71-10690

THE GEOLOGICAL SURVEY AND WATER FOR SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 06B.
W71-10713

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA WATER YEAR 1970.
Wyoming Univ, Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 02B.
W71-10753

WATER RESOURCES DATA FOR KANSAS, 1970, PART 1. SURFACE-WATER RECORDS,
Geological Survey, Lawrence, Kans.
M. L. Thompson and R. E. Curtis, Jr.
Copies may be obtained from District Chief, Water Resources Div., U.S. Geological Survey, P.O. Box 3267, Lawrence, Kansas 66044. Geological Survey Basic Data Duplicated Report, 1971. 216 p, 2 fig, 3 ref.

Descriptors: *Surface waters, *Streamflow, *Hydrologic data, *Data collections, *Kansas, Lakes, Reservoirs, Streams, Stream gages, Gaging stations, Discharge measurement, Flow rates, Peak discharge, Low flow, Water levels.
Identifiers: *Basic data.

Surface-water records for the 1970 water year (Oct. 1, 1969-Sept. 30, 1970) for Kansas, including records of streamflow or reservoir storage at gaging stations and partial-record stations, are presented. Records for a few pertinent gaging stations in bordering States also are included. The data comprise a description of the station and tabulations of basic data. For gaging stations on streams or canals a table showing the daily discharge and monthly and yearly discharge is given. The description of the gaging station gives the location, drainage area, period of record, type and history of gages, average discharge, extremes of discharge or contents, and general remarks. Peak discharges and their times of occurrence and corresponding gage heights for many stations are listed below the yearly summary. Data collected at partial-record stations are given in two tables at the end of the surface-water records. The first is a table of discharge measurements at low-flow partial-record stations; the second is a table of annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W71-10811

COMBINED HEAT, ICE AND WATER BALANCES AT SELECTED GLACIER BASINS--A GUIDE FOR COMPILATION AND ASSEMBLAGE OF DATA FOR GLACIER MASS BALANCE MEASUREMENTS.
For primary bibliographic entry see Field 02C.
W71-10823

WATER RESOURCES OF NORTHEASTERN MISSOURI,
Geological Survey, Washington, D.C.; AND Missouri Geological Survey and Water Resources, Rolla.
E. E. Gann, E. J. Harvey, H. G. Jeffery, and D. L. Fuller.
For sale by U.S. Geological Survey, Washington, D.C. - Price $2.00 per set. Geological Survey Hydrologic Investigations Atlas HA-372, 4 sheets, 1971. Text, 25 fig, 13 map, 7 tab, 22 ref.

Descriptors: *Water resources development, *Hydrologic data, *Charts, *Missouri, Surface waters, Groundwater, Reviews, Streamflow, Hydrogeology, Water wells, Aquifer characteristics, Urbanization, Water pollution, Water quality, Sediment transport, Precipitation (Atmospheric), Hydrographs, Industries, Cities, Data collections.
Identifiers: *Hydrologic Atlas (Northeastern Missouri).

This 4-sheet atlas presents a general summary of information concerning the availability, distribution, and quality of water in northeastern Missouri. Also included are problems and possibilities related to development of the water resources of the area. Maps, tables, graphs, and illustrations are used to present data and information for surface water and groundwater hydrology concerning pollution, irrigation, sediment transport, urbanization, flooding, industry, and recreation. (Woodard-USGS)
W71-10825

DISCUSSION ON 'STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMUM RESERVOIR OPERATION', BY WILLIAM S. BUTCHER,
Michigan Univ., Ann Arbor. Dept. of Industrial Engineering.
Shiaw-Yuan Su.
Water Resources Bulletin, Vol 7, No 3, p 607-608, June 1971. 2 p, 8 ref.

Descriptors: *Reviews, *Dynamic programming, *Stochastic processes, *Reservoir operation, Optimization, Systems analysis, Computer programs, Operations research.
Identifiers: *Markov chains.

Several results and procedures reported by Butcher on stochastic programming for optimum reservoir

operation were questioned. The work of Howard and Bellman among others was used to illustrate optimal operating policies derived by using dynamic programming models such as those presented by Butcher. The relatively large amount of computer time required to solve Butcher's example reservoir operating problem was compared to that required to solve similar problems on an IBM 360-67 at the University of Michigan. (Veverka-Cornell)
W71-10854

EXPERIENCE WITH THE PARTIAL DIFFERENTIAL EQUATION LANGUAGE PDEL: AN ALTERNATIVE TO HYBRID COMPUTATION,
California Univ., Los Angeles. Dept. of Computer Science.
Walter J. Karplus, and Alfonso F. Cardenas.
Research Report, (1970), 17 p, 2 fig, 1 tab, 8 ref. To appear in Proceedings of the Sixth International Meeting, AICA/IFIPS, Munich, September 1970. OWRR Project A-032-CAL (3).

Descriptors: *Computer programs, Systems analysis, Digital computers.
Identifiers: *PDEL.

The partial differential equation language, PDEL, permitted the digital computer programming of complex elliptic, parabolic, hyperbolic, and biharmonic partial differential equations with only a very minimal knowledge of programming and numerical analysis. This paper considered the effectiveness of PDEL when compared to more conventional analog and hybrid methods of handling field problems. The overall concepts of PDEL were briefly summarized followed by a discussion of two sample problems which were solved on the digital computer. Major advantages were: (1) independence from special purpose hardware, linkage systems, and programming methods; (2) generality; (3) simplicity of programming; and (4) programming speed. Major disadvantages were: (1) execution speed; (2) lack of interaction due to the batch orientation of PDEL; and (3) output format. (Veverka-Cornell)
W71-10863

USER'S MANUAL FOR THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL IV,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
John C. Warns.
M. S. Thesis, College of Engineering, Ohio State University, Columbus, 1971. 155 p, 8 fig, 6 tab, 39 ref, 4 append. OWRR Project B-019-OHIO (1).

Descriptors: *Streamflow, *Runoff, *Simulation analysis, Hydrology, Input-output analysis, Mathematical models, Digital computers.
Identifiers: *Stanford Streamflow Simulation Model IV.

The purpose of this paper was to supply a working understanding of the Streamflow Simulation Model IV so that it could be used more efficiently and effectively as a tool in hydrologic investigations. To implement this objective, the following approach was taken: (1) Discussion of the model by presenting potential applications in addition to a survey of projects which effectively used the model; (2) A review of the absolute minimum requirements for using the model (e.g. financial and manpower resources, and computer facilities); and (3) A detailed running of the model including definitions of input parameter values, modification of these parameters for refining results, and description and explanation of the output. The model was shown to augment less comprehensive streamflow calculation methods, like the Rational Formula, in that it considered more hydrologic watershed characteristics and thus presented a more realistic analysis. Data indicated that because its parameters reflected hydrologic characteristics, the model could be used to predict how the watershed would respond to physiographical and climatological changes. (Veverka-Cornell)
W71-10878

08. ENGINEERING WORKS

8A. Structures

INTAKE SYSTEMS FOR DESALTING PLANTS,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 03A.
W71-10665

SHORELINE CHANGES HUMBOLDT BAY, CALIFORNIA,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 02J.
W71-10778

ADAPTATION OF THE RADIAL FLOW ENERGY DISSIPATOR FOR USE WITH CIRCULAR OR BOX CULVERTS,
Texas Univ., Austin. Center for Highway Research.
Walter L. Moore, and Khosrow Meshgin.
Available as PB 196 971 from Nat. Tech. Inf. Service, Springfield, Va. 22151, $3.00 in paper copy, $0.95 in microfiche. Texas University, Center for Highway Research Report 116-1, July 1970. 88 p, 59 fig, 2 tab, 3 ref.

Descriptors: *Energy dissipation, *Stilling basins, *Hydraulic jump, *Culverts, Hydraulic structures, Hydraulics, Hydraulic models, Urbanization.
Identifiers: *Energy dissipators (Culverts).

Methods were investigated for adapting the radial flow energy dissipator previously developed for box culverts, for use with circular culverts. The basic criteria were the stability of hydraulic jump, the efficiency of the spreading action, and the degree of velocity reduction in the jump. The more complex geometric forms showed no particular improvement over the simple curved drop section. Relative simplicity of construction is strongly in favor of the arrangements with the simple curved drop and straight horizontal transverse elements. (Knapp-USGS)
W71-10821

8B. Hydraulics

HYDRAULIC JUMPS IN TURBIDITY CURRENTS,
Saint Andrews Univ. (Scotland). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W71-10453

MAGNITUDE OF INTERFACIAL SHEAR IN EXCHANGE FLOW,
Waterloopkundig Laboratorium, Delft (Netherlands).
G. Abraham, and W. D. Eysink.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 2, p 125-151, 1971. 27 p, 17 fig, 2 tab, 13 ref.

Descriptors: *Stratified flow, *Saline water intrusion, *Locks, *Interfaces, *Shear drag, Flow resistance, Saline water-freshwater interfaces, Shear, Hydraulic models, Model studies, Viscosity, Reynolds number.
Identifiers: Interfacial shear.

In stratified flows the interfacial shear can be expressed as a function of the relative velocity between both layers (squared), the mean density of fluids involved, and the dimensionless interfacial shear stress coefficient. This holds both for analytical solutions as well as for solutions by means of a hydraulic model. For instance analytical expressions for the length of an arrested salt wedge show the length of the wedge to be inversely proportional to the magnitude of the interfacial shear stress coefficient. The scale to be selected for a hydraulic model of an arrested salt wedge depends upon the ratio of the interfacial shear stress coefficient in model and prototype. In this paper an experimental relationship between the interfacial shear stress coefficient and the Reynolds number is given for the case of lock exchange flows. This relationship is obtained from an analysis of experimental data from experiments performed by the Delft Hydraulics Laboratory. (Knapp-USGS)
W71-10469

THE IRROTATIONAL THEORY OF ANNULAR SOLITARY WAVES,
Engineering Labs., Cambridge (England).
A. M. Binnie.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 2, p 153-162, 1971. 10 p, 3 fig, 9 ref.

Descriptors: *Waves (Water), *Closed conduit flow, *Rotational flow, Vortices, Hydraulics, Froude number, Velocity, Standing waves.
Identifiers: Revolving streams.

The velocity of a solitary wave on the surface of the core of a revolving stream is calculated by a modification of the method that Rayleigh used for a solitary wave in an open channel. The nature of the solution differs according to whether velocity is subundal or superundal; that is, the Froude number is less or greater than unity. A numerical analysis shows that the wave exists only for Froude numbers between 0.25 and 2.5 approximately. It is wave of depression on a subundal stream and of elevation on a superundal stream. (Knapp-USGS)
W71-10470

DESIGN CURVES FOR REGULAR AND RANDOM WAVE GENERATORS,
Hydraulics Research Station, Wallingford (England).
G. Gilbert, D. M. Thompson, and A. J. Brewer.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 2, p 1630196, 1971. 34 p, 7 fig, 2 tab, 6 ref.

Descriptors: *Waves (Water), *Hydraulic models, *Hydraulic design, Design, Mathematical studies, Data processing, Simulation analysis, Model studies.
Identifiers: *Wave generators.

The forces and paddle strokes required to generate regular water waves with piston and hinged wave-generators are analyzed. Exact dimensionless values are given for the forces and paddle strokes over a wide range of a dimensionless parameter which depends directly on the wave period rather than on the wave length. The hinged, the piston and the wedge generators are analyzed and the results presented graphically. The force and stroke coefficients from the above analysis are applied as transfer functions to calculate the spectra of the stroke and forces required to generate a Moskowitz spectrum of wind waves. The mean square stroke and forces, which are obtained by integrating the appropriate spectra, are presented graphically in dimensionless form as a function of a parameter specifying the required wave spectrum. The maximum stroke and forces which provide the basis for design can be calculated from the curves for both regular and random waves. (Knapp-USGS)
W71-10471

A CONTRIBUTION TO FORCED HYDRAULIC JUMPS,
Alberta Univ., Edmonton. Dept. of Civil Engineering; and Provincial Dept. of Agriculture, Edmonton (Alberta). Water Resources Div.
N. Rajaratnam, and V. Murahari.

Text in English and French. Journal of Hydraulic Research, Vol 9, No 2, p 217-239, 1971. 23 p, 20 fig, 1 tab, 17 ref.

Descriptors: *Hydraulic jump, *Stilling basins, *Hydraulic models, Model studies, Mathematical studies, Turbulent flow, Critical flow, Hydraulics, Jets, Turbulent boundary layers, Eddies, Vortices, Shear drag, Flow resistance.
Identifiers: *Forced hydraulic jumps.

An experimental study was made of forced hydraulic jumps formed with two dimensional baffles or baffle walls. Using dimensional analysis, the integral momentum equation, and experimental results, the drag on the baffle wall was analyzed, and a design chart for a preliminary design of stilling basins is presented. The mean flow characteristics in forced jump were analyzed using as models turbulent wall jets and plane turbulent curved free jets in the proper regions. Some observations were also made regarding the flow in the eddying region behind the baffle wall. (Knapp-USGS)
W71-10473

PRESSURE AND VELOCITY DISTRIBUTION FOR SHARP-CRESTED WEIRS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam, and D. Muralidhar.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 2, p 241-248, 1971. 8 p, 8 fig, 1 tab, 4 ref.

Descriptors: *Weirs, *Hydraulic models, *Overflow, *Hydraulics, Velocity, Pressure, Open channel flow, Discharge coefficients, Discharge measurement.
Identifiers: Sharp-crested weirs.

Precise measurements were made of the pressure and velocity field in the strongly curvilinear region of flow in the neighborhood of the crest of a rectangular sharp-crested weir over a range of H/P from about 0.2 to 8.5. The upstream velocity distribution was not significantly affected by the weir. The results of the study are presented graphically. (Knapp-USGS)
W71-10474

THEORY OF DIMENSIONS AND SPURIOUS CORRELATION,
Queen's Univ. Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-10475

FLUME STUDY OF RIPPLE PROPAGATION BEHIND MOUNDS ON FLAT SAND BEDS,
Massachusetts Inst. of Technology, Cambridge. Dept. of Earth and Planetary Sciences; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02J.
W71-10478

AN OPTIMUM PATH TO RESERVOIR DESIGN BASED ON THE WORTH OF DATA,
Geological Survey, Fort Collins, Colo. Engineering Research Center.
For primary bibliographic entry see Field 04A.
W71-10573

METHODS OF CALCULATING DRAIN-DEVICE SPACING (O metodakh opredeleniya rasstoyaniy mezhdu drenami),
For primary bibliographic entry see Field 04A.
W71-10588

UNSTEADY INERTIAL EFFECTS IN FLUID FLOW THROUGH POROUS MEDIA,
Wisconsin Univ., Madison. Water Resources Center.
John A. Spooner.
Available from the National Technical Information Service as PB-201 744, $3.00 in paper copy, $0.95 in microfiche. Technical Report (Ph D Thesis), Water Resources Center, The University of Wisconsin, Madison, Wisconsin, 1971, 143 p, 29 fig, 6 tab, 28 ref, 9 append. OWRR B-021-WIS (2).

Descriptors: *Momentum equation, *Unsteady flow, *Porous media, *Darcys law, *Hydraulic conductivity, Continuity equation, Flow, Conductivity, Fluid mechanics, Water pressure, Hydrostatic pressure, Compressibility.
Identifiers: *Static value, *Darcy value, *Saturation, Pressure waves.

Linear inertial terms are included in the momentum equation for the unsteady flow. The continuity equation is given in terms of the compressibilities of the constituents involved--solid, gas, and/or liquid. Coupling between the fluid and solid constituents is not considered. When these two equations are combined, the result is a hyperbolic partial differential equation for pressure. The solution of this equation is used to describe the propagation of pressure waves in the fluid in the porous medium. Theoretical solutions for a harmonic, repetitive pulse, and step input in pressure are obtained. The frequency dependence of the hydraulic conductivity is demonstrated when harmonic or repetitive pulses are considered. The hydraulic conductivity is time dependent when a step variation in pressure is introduced. Experimental measurements were conducted on air dry, liquid saturated, partially liquid saturated, and drained sands. The results of the experiments were found to be in agreement with the theory for all but the liquid saturated case. Methods for determining the static (Darcy) hydraulic conductivity and compressibility using sound wave propagation are developed and applied.
W71-10643

APPLICATION OF MAGNETOHYDRODYNAMICS TO MEASUREMENT OF LIQUID VELOCITY AND TURBULENCE,
Wisconsin Univ., Madison. Water Resources Center.
James R. Villemonte, John A. Hoopes, and Heinz H. Lettau.
Available from the National Technical Information Service as PB-201 695, $3.00 in paper copy, $0.95 in microfiche. Technical Completion Report, Water Resources Center, The University of Wisconsin-Madison, Wisconsin. 1971, 80 p, 39 fig, 55 ref, OWRR A-033-WIS (2) and OWRR B-012-WIS (2).

Descriptors: *Turbulence, *Dispersion, *Diffusion, Water flow, *Correlation analysis, *Reynolds number, Flow, Data acquisition, *Velocity, Turbulent flow, *Pipes, *Pipe flow, Hydrodynamics, Fluid mechanics.
Identifiers: *Magnetohydrodynamics (MHD), Energy spectra, Mean flows, 2-D jet flow, Hybrid computer, Portable velocity, Turbulence meters.

Phase 1 was a study of the application of magnetohydrodynamic (MHD) techniques to the measurement of turbulence in the flow of water in pipes. A three element probe was developed permitting the simultaneous measurement of the axial and radial components of the turbulent velocities. The effect of probe electrode spacing was studied. The induced emf signals were analyzed by a Hybrid computer to give turbulence intensities, energy spectra, and various correlations for a wide range of Reynolds number. It was concluded that the MHD probe is a very satisfactory device for studying the phenomena of turbulent flow. Phase 2 was a study of the structure of turbulence of a 2-D jet of water impinging into a stagnant body of water. The theoretical phase developed expressions for the mean and turbulent velocity distributions. The experimental phase measured mean and turbulent velocities and turbulent intensities, energy spectra, and various correlations, using analogous MHD techniques, as in Phase 1. It was concluded that the turbulence characteristics for water were similar to those for air, but the water intensities were about 1/3 those of air. Phase 3 was a study of the portable MHD drogue-like mean and turbulent velometers. The AC, low-gauss magnet used in the mean velometer permitted measurement of mean velocities down to 0.004 fps. It was concluded that this device is competitive with and potentially better than the traditional vane and bucket type velometers.
W71-10644

APPLICATION OF SURFACE PRESSURE TO ASSIST WATER RECHARGE INTO THE OGALLALA FORMATION,
Texas Tech Univ., Dept. of Petroleum Engineering, Lubbock.
For primary bibliographic entry see Field 04B.
W71-10684

WATER-DROP--SURFACE-WAVE INTERACTIONS,
California Univ., Los Angeles. Dept. of Meteorology.
G. L. Siscoe, and Zev Levin.
Journal of Geophysical Research, Vol 76, No 21, p 5112-5116, Jul 20, 1971. 5 p, 2 fig, 6 ref.

Descriptors: *Waves (Water), *Drops (Fluids), *Impact (Rainfall), Jets, Hydraulics, Fluid mechanics.
Identifiers: *Water-drop-wave interactions, *Splashing, Water-drop impact.

Splashes on smooth liquid surfaces have been well described, but in actual field situations splashes usually occur on disturbed surfaces. This report describes two new types of splashes that occur in the presence of surface waves. These were studied with drops falling from a buret into the center of a circular battery jar filled with water. Each drop interacted with the reflected waves produced by the preceding drops. A drop impacting near the time of a crest of the surface wave produces intense surface waves and a diminutive Rayleigh jet. A drop impacting near the time of a trough of the surface wave produces weak surface waves but an unusually high Rayleigh jet. The great difference in these two types of interactions implies that any study of transportation or electrification due to splashes must include drop surface-wave effects. (Knapp-USGS)
W71-10702

ACTIVE VALLEY MEANDERS IN SOUTH-CENTRAL TEXAS AND THEIR WIDER IMPLICATIONS,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W71-10706

THE RIVER PROFILE,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W71-10730

HUDSON RIVER CHANNEL, NEW YORK AND NEW JERSEY PLANS TO REDUCE SHOALING IN HUDSON RIVER CHANNELS AND ADJACENT PIER SLIPS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons, and W. H. Bobb.
Available from the National Techinal Information Service as AD-720 971, $3.00 in paper copy, $0.95 in microfiche. Waterways Experiment Station Technical report, Report no. TR-2-694, Sept. 1965.

Descriptors: *Model studies, *Hydraulic models, *Shoals, *Navigation, *Harbors, Tides, Test procedures, Salinity, Sedimentation, Dredging, New York, New Jersey.

Identifiers: Hudson River, New York Harbor, Harlem River.

A comprehensive model which correctly reproduced tides, tidal currents, density currents, and shoaling in the entire New York Harbor complex was used to study plans for reducing maintenance dredging in the lower 11 miles of the Hudson River which annually amounts to about 1.6 million cubic yards for the Federally maintained navigation channels and 3.0 million cubic yards for the privately owned pier slips. The plans studied involved channel realignments, sediment basins, dikes, closure gates, and cross-section enlargements, and tests were made to determine plan effects on hydraulic conditions, salinity conditions, and shoaling.
W71-10771

HYDRAULIC RESEARCH IN THE UNITED STATES-1970. INCLUDING CONTRIBUTIONS FROM CANADIAN LABORATORIES FROM CANADIAN LABORATORIES,
National Bureau of Standards, Washington, D.C.
Gershon Kulin, and Pauline H. Gurewitz.
Available from the National Technical Information Service as COM-71-50147, $3.00 in paper copy, $0.95 in microfiche. NBS Special publication 346, Mar 1971. 346 p. For sale by the SOD, GPO, Wash, DC 20402--Price $2.50.

Descriptors: *Hydraulics, *Laboratories, *Hydrodynamics, *Research facilities.
Identifiers: Hydraulic laboratories, *Research management.

Current and recently concluded research projects in hydraulics and hydrodynamics for the years 1969-1970 are summarized. Projects from more than 250 university, industrial, state, and Federal government laboratories in the United States and Canada are reported.
W71-10801

BASIC CONSIDERATIONS OF WELL DESIGN,
Bureau of Reclamation, Denver, Colo. Div. of Drainage and Groundwater Engineering.
For primary bibliographic entry see Field 04B.
W71-10815

ADAPTATION OF THE RADIAL FLOW ENERGY DISSIPATOR FOR USE WITH CIRCULAR OR BOX CULVERTS,
Texas Univ., Austin. Center for Highway Research.
For primary bibliographic entry see Field 08A.
W71-10821

8C. Hydraulic Machinery

COST OF STEAM SUPPLY FOR DESALTING USING COAL FIRED BOILERS,
Sanderson and Porter, Inc., New York.
For primary bibliographic entry see Field 03A.
W71-10658

8D. Soil Mechanics

A COMPARISON OF TWO METHODS FOR MEASURING RIGIDITY OF SATURATED MARINE SEDIMENTS,
Naval Postgraduate School Monterey, Calif.
James Bryan Lasswell.
Available from the National Technical Information Service as AD-722 580, $3.00 in paper copy, $0.95 in microfiche. MS, Thesis, Naval Postgraduate School December 1970, 65 p.

Descriptors: *Beds, *Soil mechanics, *Shear stress, *Sedimentation, Silt clay density, Porosity, Correlation analysis, Rigidity, Cohesive soils.
Identifiers: *Ocean bottom, Interfaces, Sound transmission, Echo ranging.

The results of two different methods for determining the rigidity modulus of a soft sediment are compared. In one method the resonant characteristics of a torsionally oscillating rod which are sensitive to the shear acoustic impedance of sediment in which the rod is imbedded determine the complex rigidity. The second method utilizes the observation of the phase velocity of an interface wave at the water-sediment boundary. Shear wave speeds computed from the experimental data from both methods are quite similar in magnitude. For the sediment used here, the average value of shear wave speed determined from the interface wave experiment was 33 m/sec while the shear wave speed determined from the measured rigidity was 29 m/sec. The difference lies within experimental uncertainty. Trends in the mass-physical properties of the sediments are investigated by comparing graphically the dependence of both the real and imaginary parts of the complex rigidity on density, porosity, sound speed, silt and clay percentages, Poisson's ratio and density times sound speed squared.
W71-10668

CRACKING OF EARTH AND ROCKFILL DAMS. TENSION ZONES IN EMBANKMENTS CAUSED BY CONDUITS AND CUTOFF WALLS,
Harvard Univ., Cambridge, Mass.
Arthur Casagrande, and Sergio W. Covarrubias.
Available from the National Technical Information Service as AD-720 550, $3.00 in paper copy, $0.95 in microfiche. Waterways Experiment Station contract report S70-7, July 1970. 39 p.

Descriptors: *Dams, *Cracks, *Foundations, *Shear stress, Elasticity, Rock fill dams, Earth dams, Pipes, Embankments, Walls, Compressive strength, Loading, Surfaces.
Identifiers: Compressive properties, Loading, Numerical analysis, Finite element analysis.

The purpose was to investigate by means of the finite element method (1) the effect of rigid conduits and cutoff walls on the stress distribution and on the development of tension zones in embankments and their foundations, and (2) the distribution of stresses acting on the sides of conduits and cutoff walls. All materials were assumed to be linearly elastic with equal properties in tension and in compression. The only load considered was the weight of the embankment and it was assumed to be applied in a single lift. Detailed investigation by means of the finite element method included six cases of conduits and four cases of cutoff walls. In the case of conduits, it was demonstrated that tension zones occur adjacent to conduits with sharp edges, and that the presence of a zone of more compressible material above the roof effectively improves the loading conditions on the conduit. In the case of cutoff walls beneath embankments, it was shown that tension zones develop in the upper part of the embankment and adjacent to the top of the wall. While the presence of a zone of more compressible material on top of the wall reduces the load on the upper surface of the wall, it somewhat increases the friction forces along the sides of the wall.
W71-10795

THE EFFECT OF VARYING THE PARAMETERS OF VANE SHEAR TESTS OF MARINE SEDIMENTS,
Naval Postgraduate School Monterey, Calif.
James Charles Singler.
Available from the National Technical Information Service as AD 722 568, $3.00 in paper copy, $0.95 in microfiche. Thesis, MS, March 1971, U.S. Naval Postgraduate School, 73 p.

Descriptors: *Beds, *Soil mechanics, *Sedimentation, *Shear stress, Sediments, Test procedures.
Identifiers: *Ocean bottom, Flexural strength, Ocean bottom sampling, Test equipment, Vane shear tests.

The consequences resulting from varying the parameters of the vane shear test (used to determine the shear strength of marine sediments) were investigated. Experiments showed that larger ratios of container diameter to vane diameter yield more accurate shear strengths. It was also shown that the four-bladed vane produced the best results. Finally, rates of rotation of one and two revolutions per hour were found to give accurate values of shear strength, while higher rates of rotation proved to be unsatisfactory.
W71-10899

DIRECT SHEAR TESTING OF MARINE SEDIMENT,
Naval Postgraduate School Monterey, Calif.
John Stoddard Berg.
Available from the National Technical Information Service as AD-722 567, $3.00 in paper copy, $0.95 in microfiche. Thesis, MS, March 1971, U.S. Naval Postgraduate School. 76 p.

Descriptors: *Beds, *Soil mechanics, *Sedimentation, *Shear stress, Sediments, Test procedures.
Identifiers: *Ocean bottom, Flexural strength, Ocean bottom sampling, Test equipment.

Traditionally, the methods used to determine the mechanical properties of marine sediments were those used in the field of soil mechanics. These methods are generally acceptable when the sediment tested is plastic or at water contents below the liquid limit. However, for predicting in-situ conditions, that is for sediment at water contents above the liquid limit, the problem is complex. Specifically, the determination of shear strength of an unconsolidated-undrained sample by the direct shear method was found to exhibit an angle of internal friction ranging from 19 degrees to 23.5 degrees. This indicates that the shear strength of the sediments is dependent on the normal load applied to it.
W71-10900

8G. Materials

THE EFFECT OF AEROBIC MARINE BACTERIA ON THE CORROSION OF METALS IN SEA WATER,
Miami Univ., Fla.
For primary bibliographic entry see Field 03A.
W71-10659

TEST EVALUATION OF 2,500 GPD SEAWATER REVERSE OSMOSIS UNIT,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 03A.
W71-10662

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

A REVIEW OF ACTIVITIES--1966-1971.
Massachusetts Univ., Amherst. Water Resources Center.
For primary bibliographic entry see Field 06B.
W71-10450

HYDRAULIC RESEARCH IN THE UNITED STATES-1970. INCLUDING CONTRIBUTIONS FROM CANADIAN LABORATORIES FROM CANADIAN LABORATORIES,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 08B.
W71-10801

9C. Research Facilities

A RECIRCULATING SEAWATER AQUARIUM SYSTEM FOR INLAND LABORATORIES,
Oregon Univ., Eugene.
M. E. Lickey, R. L. Emigh, and F. R. Randle.
Marine Biology, Vol 7, No 2, p 149-152, October, 1970. 2 fig, 4 ref. PHS Grant NB-07458.

Descriptors: *Aquaria, *Gastropods, *Recirculated water, Aquiculture, Mollusks, Snails, Cultures, Sea water, Fish handling facilities, Equipment, Growth chambers, Laboratory equipment, Research facilities.
Identifiers: *Aquarium systems, Laboratory facilities, Aplysia sp., Hermissenda sp., Tritonia sp.

A 7500-liter recirculating aquarium system for maintenance of marine gastropods in an inland laboratory was designated and installed. It is completely nonmetallic and can be adapted for any number of isloated living compartments. Convenient and efficient filtration temperature is achieved by the use of disposable cartridge filters. The water temperature is regulated by a direct expansion cooling coil and a hot water heating coil without intervention of secondary heat transfer fluids. Most of the water is stored in an underground reservoir which contributes to thermal stability, and the water temperature varies less than plus or minus 0.1 C per week. The pH and specific gravity remain at 8.0 plus or minus 0.1 and 1.023 plus 0.002 minus 0.001, respectively, for as long as four months. No evidence is available to indicate that any animal (Aplysia, Hermissenda, Tritonia spp.) has died due to poor water quality. The system is constructed from readily available components, is moderate in cost, and has performed reliably for over two years. (LeGore-Washington)
W71-10565

9D. Grants, Contracts, and Research Act Allotments

A REVIEW OF ACTIVITIES--1966-1971.
Massachusetts Univ., Amherst. Water Resources Center.
For primary bibliographic entry see Field 06B.
W71-10450

10. SCIENTIFIC AND TECHNICAL INFORMATION

WATER POLLUTION FROM EROSION.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05C.
W71-10674

A REVIEW OF THE 1970 LITERATURE ON WASTE WATER AND WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 05G.
W71-10691

ROUTINE ANALYTICAL METHODS,
For primary bibliographic entry see Field 05A.
W71-10692

AUTOMATED AND MONITORING TECHNIQUES,
For primary bibliographic entry see Field 05A.
W71-10693

COAL, COAL BY-products, and COAL MINE DRAINAGE,
For primary bibliographic entry see Field 05B.
W71-10694

WATER POLLUTION BY OIL SPILLAGE,
For primary bibliographic entry see Field 05B.
W71-10695

ECOLOGICAL EFFECTS OF OIL POLLUTION,
For primary bibliographic entry see Field 05C.
W71-10696

ACCUMULATION OF MERCURY AND ITS COMPOUNDS,
For primary bibliographic entry see Field 05B.
W71-10697

PRECIPITATION AND ITS MEASUREMENT, A STATE OF THE ART,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 02B.
W71-10752

NATURAL OIL SEEPS IN OR NEAR THE MARINE ENVIRONMENT: A LITERATURE SURVEY,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-10763

BIBLIOGRAPHY OF TECHNICAL REPORTS 1970,
Woods Hole Oceanographic Institution, Mass.
Cecelia B. Fuglister.
Available from the National Technical Information Service as AD-722 598, $3.00 in paper copy, $0.95 in microfiche. Woods Hole Reference No 70-70, Jan 1971. 17 p.

Descriptors: *Oceanography, *Ocean currents, *Marine geology, Fish, *Hydrophones, Water pollution effects, Sedimentation, Bibliographies.
Identifiers: *Oceanology, Continental shelves, Magnetic anomaly detection, Seismic waves, Reflection, Underwater vehicles, Deep submergence, Underwater sound, Mooring buoys, Hydrographic surveying, Data processing systems.

The report contains bibliographies of research in oceanology; Sedimentation; Hydrographic surveying; Marine geology; Marine biology; Ocean bottom sampling, ocean currents, and marine geochemistry.
W71-10776

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W71-10495 02I

THE UPTAKE AND DISTRIBUTION OF CHLORINATED RESIDUES BY GOLDFISH (CARASSIUS AURATUS) FED A C-14-DIELDRIN CONTAMINATED DIET,
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METABOLISM OF PESTICIDES IN MARINE ORGANISMS, I. PRELIMINARY STUDY OF ACCUMULATION AND TRANSFORMATION OF DDT-14C BY THE POLYCHAETE NEREIS DIVERSICOLOR. (GERMAN STOFFWECHSEL VON PESTICIDEN IN MARINEN ORGANISMEN I VORLAVFIGE UNTER SUCHUNGEN UBER DIE VMWANDLUNG UND AKKUM VIATION VON DDT-14C DVRCH DEN POLYCHAETEN NEREIS DIVERSICOLOR,
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W71-10700 05B

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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

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- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

Subject Fields

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- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
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